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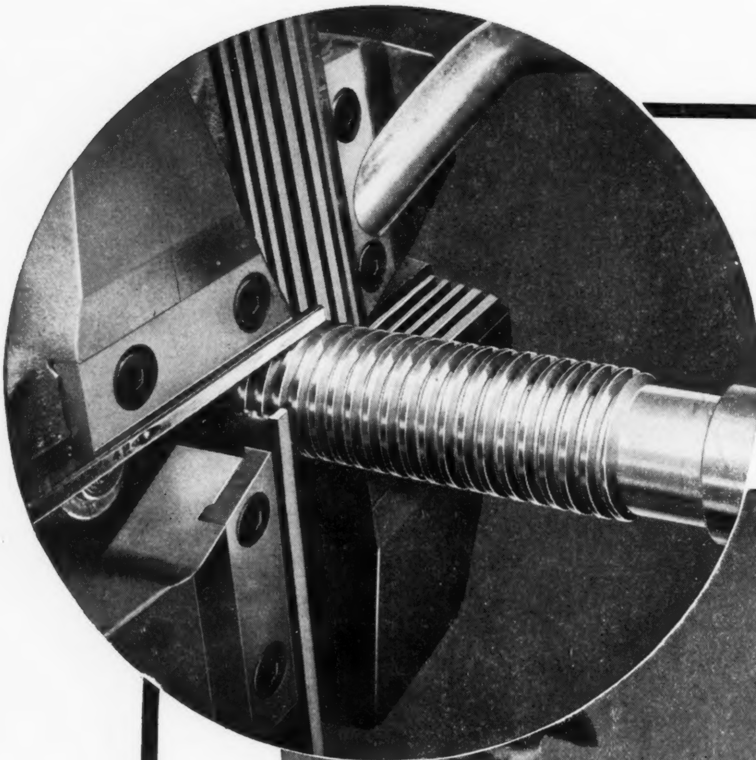

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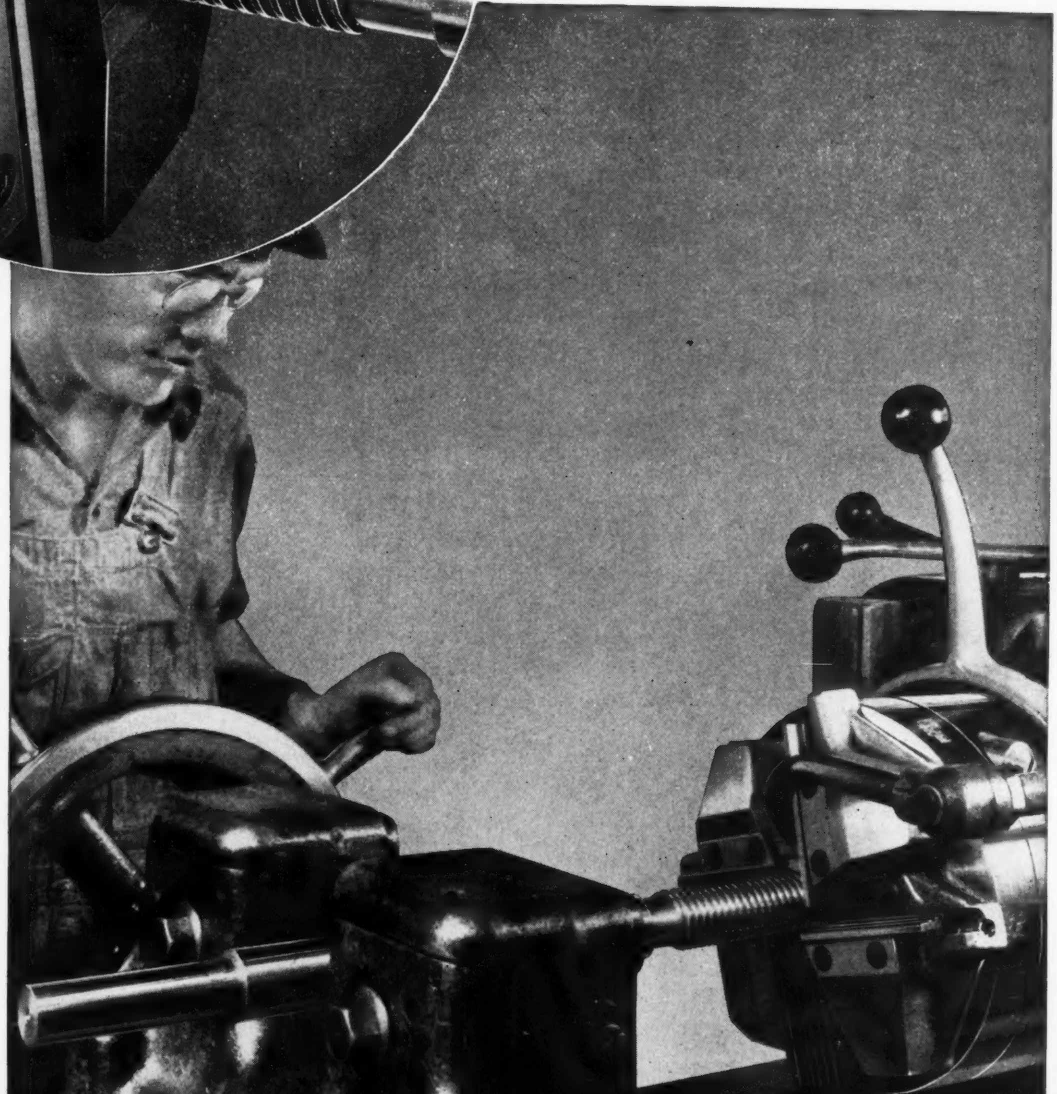

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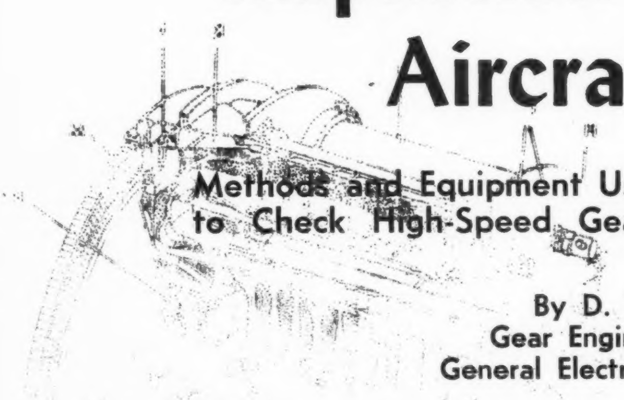
Inspection of Precision Aircraft Gears



Methods and Equipment Used by the General Electric Co. to Check High-Speed Gears for Aviation Gas Turbines

By D. W. DUDLEY
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IN some types of gearing, satisfactory performance can be expected if the gearing meets one or two simple tests. For example, in certain machines, a running test to determine whether or not the gears are noisy may be the only check that is necessary; in some instrument applications where backlash is objectionable, a test to determine that the backlash does not exceed the permissible limits and that the gears revolve with reasonable freedom is sometimes sufficient.

However, precision gears and splines, such as those used in aircraft, must be manufactured to exacting tolerances, and sufficient checks must be made during the various manufacturing operations to insure that all dimensions of the final product are within the required tolerances. It is necessary to inspect the accuracy of the tooth

Analysis of Dividing-Head Readings

Tooth Number	Dividing-Head Reading, Inch	Pitch Error	
		Amount, Inch	Variation, Inch
1	0		
2	+ 0.0001	+ 0.0001	0.0000
3	+ 0.0001	0.0000	0.0001
4	+ 0.0001	0.0000	0.0000
5	+ 0.0002	+ 0.0001	0.0001
6	+ 0.0002	0.0000	0.0000
7	+ 0.0003	+ 0.0001	0.0001
8	+ 0.0002	— 0.0001	0.0002
9	+ 0.0001	— 0.0001	0.0000
10	0.0000	— 0.0001	0.0000
11	— 0.0001	— 0.0001	0.0000
12	— 0.0002	— 0.0001	0.0000
13	— 0.0001	+ 0.0001	0.0002
14	0.0000	— 0.0001	0.0002
15	— 0.0001	— 0.0001	0.0000
16		+ 0.0001	0.0002

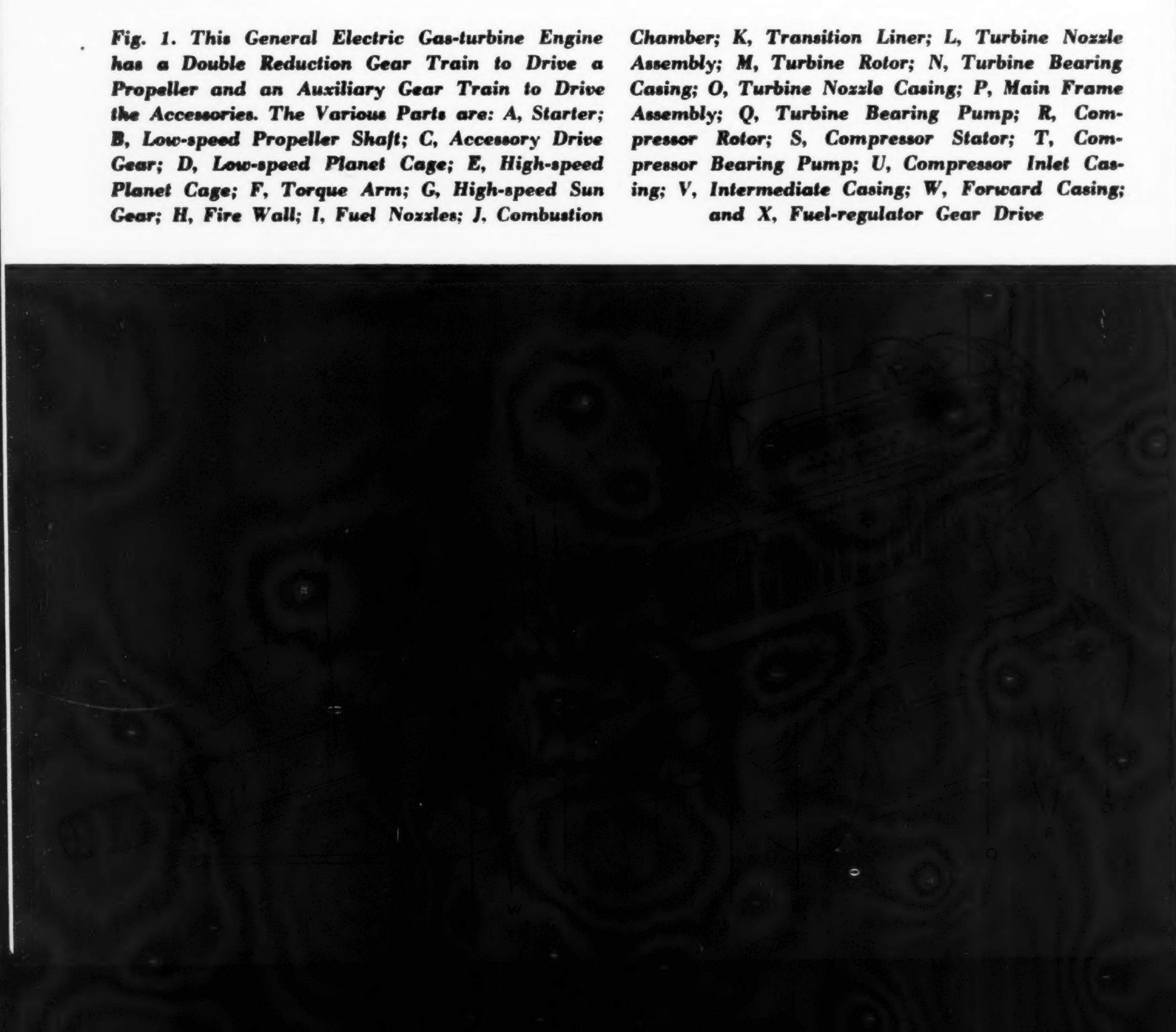
Accumulated error = 0.0005 inch; total pitch error = 0.0002 inch; maximum tooth-to-tooth variation = 0.0002 inch.

spacing, tooth profile, tooth helix, tooth size, tooth hardness, and the depth of the carburized case to insure that the gears will operate for their specified life without breakage or excessive wear. Particularly in a gas-turbine engine, such as shown in Fig. 1, is it important to control the accuracy of the gears because of the high speeds at which many of the gears and gear couplings operate; with high speeds, slight errors give rise to dynamic overloads that may easily equal or exceed the load to be transmitted.

Control of gear quality begins with control of the material. Materials for aircraft gears are purchased under rigid specifications governing both the physical and chemical properties. Only electric furnace steel is used, and all billets for forging are etch-tested to insure that there are no non-metallic inclusions, cracks, or other defects. In order to obtain the proper response to heat-treatment, a sample from each incoming lot is given a "Jominy" test to establish the hardenability characteristics of the material.

After the material has been sent to the factory, precautions are taken to insure that it is thoroughly worked to break up the fibrous grain

Fig. 1. This General Electric Gas-turbine Engine has a Double Reduction Gear Train to Drive a Propeller and an Auxiliary Gear Train to Drive the Accessories. The Various Parts are: A, Starter; B, Low-speed Propeller Shaft; C, Accessory Drive Gear; D, Low-speed Planet Cage; E, High-speed Planet Cage; F, Torque Arm; G, High-speed Sun Gear; H, Fire Wall; I, Fuel Nozzles; J, Combustion Chamber; K, Transition Liner; L, Turbine Nozzle Assembly; M, Turbine Rotor; N, Turbine Bearing Casing; O, Turbine Nozzle Casing; P, Main Frame Assembly; Q, Turbine Bearing Pump; R, Compressor Rotor; S, Compressor Stator; T, Compressor Bearing Pump; U, Compressor Inlet Casing; V, Intermediate Casing; W, Forward Casing; and X, Fuel-regulator Gear Drive



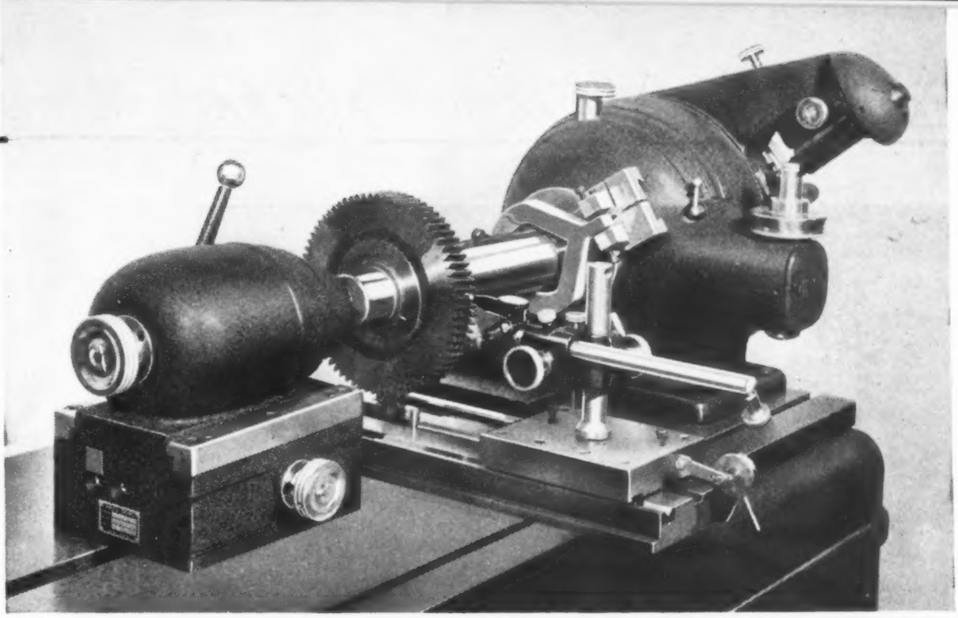


Fig. 2. All Shaving Cutters, Broaches, Index-plates, Index and Master Gears, Gages, and Finishing Cutters are Inspected to Determine the Accumulated Error in Tooth Spacing. A Shaving Cutter is Shown being Checked in This Illustration

structure. A 2 to 1 ratio between the height and cross-section of the billet has been established as a minimum requirement. Forging temperatures and the annealing cycle are accurately controlled by laboratory instructions.

Methods Employed in Checking Cutting Tools

The cutters and index-plates used in the manufacture of aircraft gas-turbine gears are specified with tolerances that in many cases are more rigid than those established in the tool trade as "precision" or Class "A." Shaving cutters, broaches, index-plates, index and master gears, gages, and finishing cutters are given a one hundred per cent check on a Vinco optical master inspection dividing head (Fig. 2) to determine the accumulated error in tooth spacing.

The check is made by revolving the part through an angle equal to the circular pitch (360 degrees divided by number of teeth in the cutter). An indicator or an electro-limit gage is moved up to a stop and then the reading of the instrument is taken. A ball-supported carriage is used to provide relatively frictionless movement of the measuring apparatus, so that consistent readings can be obtained.

The indicator is set at zero for the first tooth. Subsequent readings then show how much any tooth is out of position with respect to the first tooth. The accumulated error is the difference between the largest and smallest readings obtained; tooth-to-tooth differences can be obtained by subtraction; and the pitch error can be obtained by determining the difference between the largest and smallest tooth-to-tooth error. The method of obtaining pitch error and maximum tooth-to-tooth error is illustrated in the accompanying table, which shows the results obtained from a check on a fifteen-tooth cutter.

The accumulated error can be obtained by direct measurement of tooth-to-tooth errors. (See American Gear Manufacturers Association Standard 231.01 for method.) However, this method makes it difficult to secure an accurate accumulated error measurement when the number of teeth is large. Obviously, slight errors in tooth-to-tooth measurements will amount to large errors when tooth-to-tooth readings are

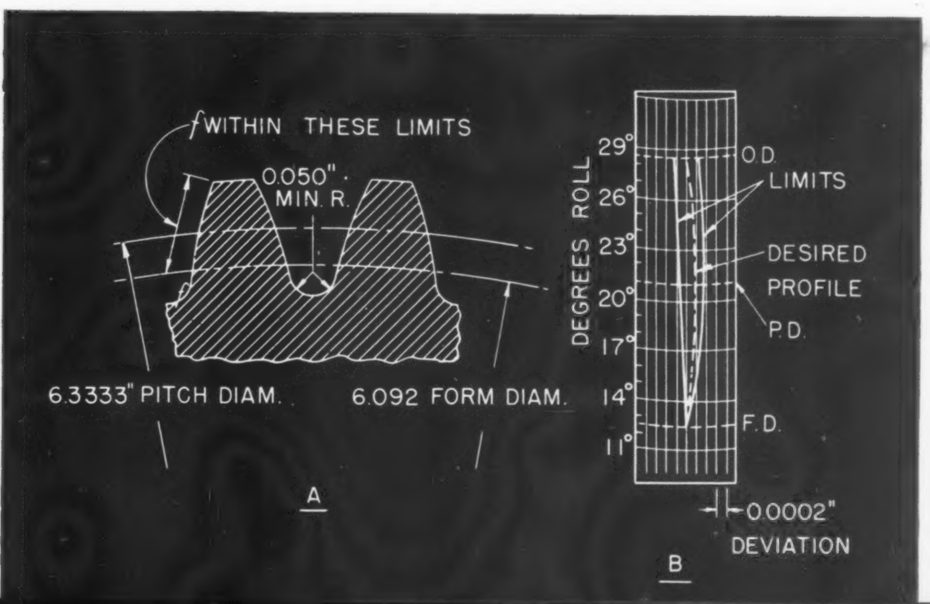


Fig. 3. A Percentage of Total Number of Gears Produced is Checked to Determine Accuracy of Tooth Profile. A Typical Involute Profile Tolerance Chart with which the Profile is Compared is Shown at B

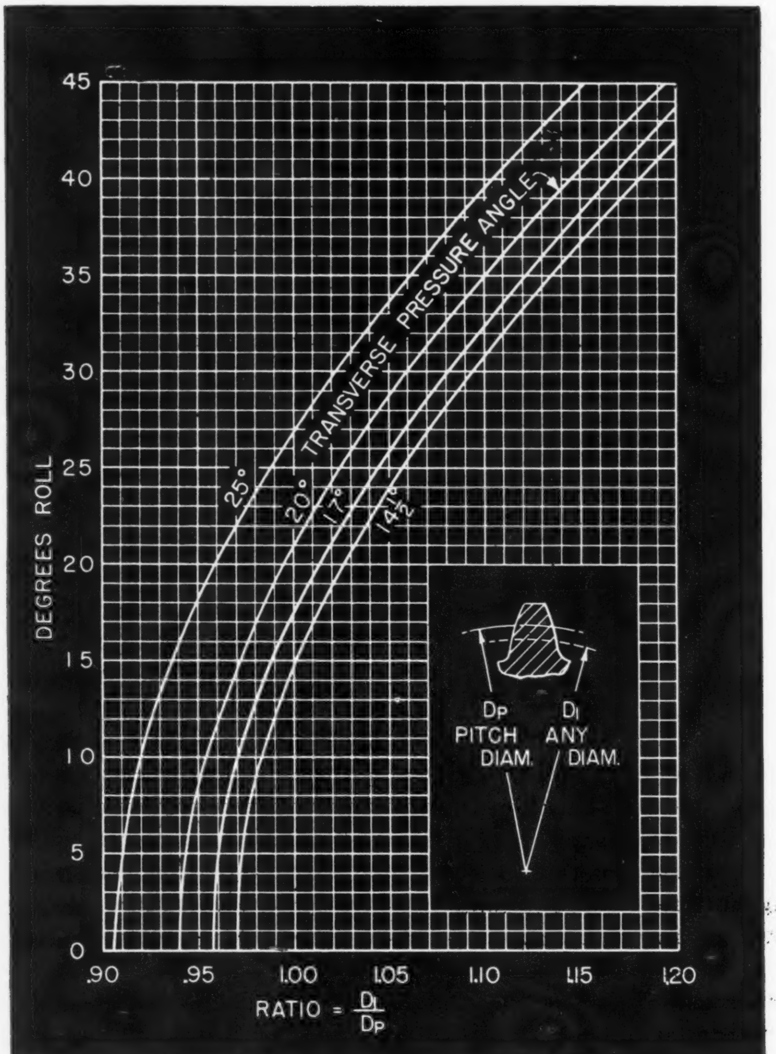


Fig. 4. (Above) Chart Employed for Converting Gear Diameters into Degrees Roll

added up to obtain the accumulated error. As will be pointed out later, accumulated errors are very important in some splines and in planetary gears.

In addition to checks on tooth spacing, the involute profile of cutting tools and the thickness of the teeth are also checked. For measuring tooth thickness, the wire method is preferred to the use of gear-tooth verniers. Verniers can be read only to the nearest 0.0005 inch on tooth thickness, while a micrometer can be read to 0.0002 inch or better on diameter. On a 20-degree pressure-angle involute, 0.0002 inch on diameter is equivalent to 0.00008 inch on tooth thickness, so the wire method is five or six times more accurate than the gear-tooth vernier method. This increased accuracy is needed in checking broaches and spline gages, which frequently are specified to be made to a total tolerance of only 0.0002 inch in tooth thickness.

Inspecting Production Gears

All production gears are checked on a Red Liner checking machine made by the Fellows Gear Shaper Co. This check is made by rolling the gear with a master gear. The master is held against the produc-

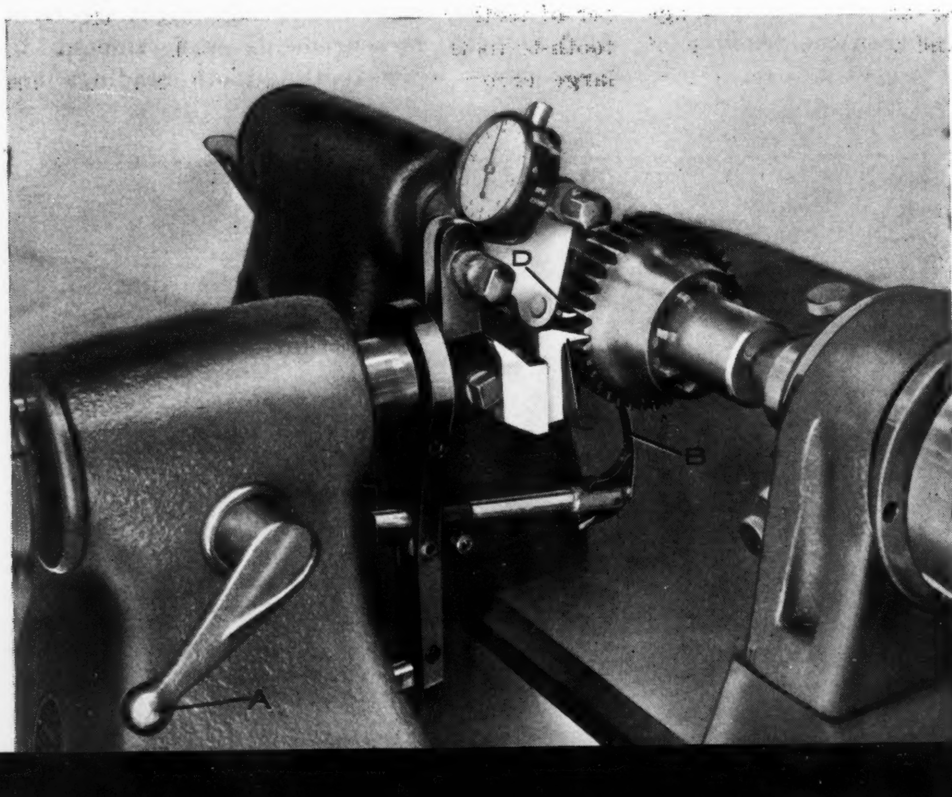


Fig. 5. A Tooth-to-tooth Type of Space Checking Machine is Employed in the Inspection of All Production Gears. Mechanical Indexing and Holding Devices are Incorporated in This Machine

tion gear by spring pressure while a recording apparatus makes a graphical plot of degrees roll of the master gear against its variation in center distance. The charts obtained give a composite check from which can be estimated the concentricity, tooth spacing error, profile error, and tooth thickness of the gear.

The maximum variation in center distance of the master gear in one revolution indicates the gear eccentricity. Since this reading may be influenced by the involute wobble in the curve, the true concentricity will be somewhat less than that shown by this check. Sometimes an attempt is made to correct the chart to obtain true concentricity, but this practice is likely to lead to argument among inspectors as to the interpretation of the results. It also tends to let questionable gears slip by, and therefore is not recommended where highest gear quality is desired.

If there is too much wobble and too many jumps in the chart, there are likely to be serious involute and spacing errors in the production gear, and additional checks of involute form and tooth spacing are, therefore, made before the gear is accepted. In addition to those gears found questionable in the master gear check, a certain number of other gears are inspected. The frequency of these checks is governed by the tolerances within which the gear must be held, as well as the manufacturing process used to finish it. Shaved gears, for example, can usually be produced with good dimensional consistency, and the number checked need not be so large as for those made by some other gear-finishing processes.

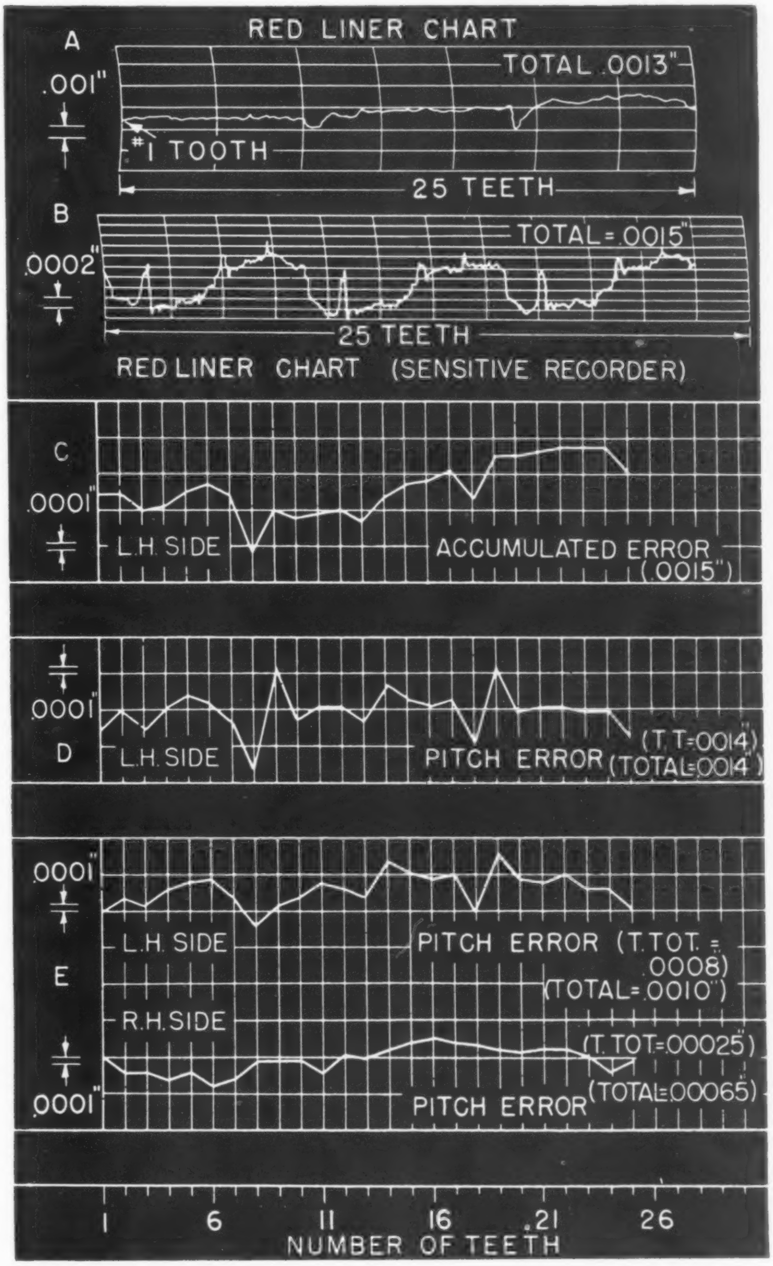


Fig. 6. Data Obtained on a Rejected Pinion with Three Different Types of Inspection Machines. Chart A was Obtained on a Red Liner Machine; Chart B, on a Red Liner Machine Equipped with a More Sensitive Recorder; Charts C and D on a Vinco Dividing-head Machine; and Charts E on a Red Ring Spacing Checker

Involute checking machines of the kind that record variations from the true involute curve versus degrees roll are used to check profile accuracy. The production drawings show the desired tooth shape and tolerance. An enlarged view of a typical gear tooth is shown in Fig. 3. The "form diameter" indicates the point at which the engineer desires the involute check to begin; it is the lowest theoretical contact point that the mating pinion makes with the gear, and includes an allowance for the eccentricity of the

Fig. 7. New Type of Internal Gear Testing Machine for Checking the Tooth Spacing, Helix Angle, and Concentricity of Internal Gears and Splines

mating pinion, the tolerance on the outside diameter of the gear, and the tolerance on the center distance of the casing in which the gear is to be mounted.

Since the involute checking machine records degrees roll, it is necessary to determine where the form diameter, pitch diameter, and outside diameter fall on the profile chart. A convenient chart for determining these points is shown in Fig. 4. For example, the ratio of the form diameter FD to the pitch diameter PD of the gear shown in Fig. 3 is

$$\frac{FD}{PD} = \frac{6.092}{6.333} = 0.962$$

With a ratio of 0.962 and a tooth having a 20-degree transverse pressure angle, the equivalent degrees roll obtained from the chart is 12.5 degrees. The form diameter can then be indicated on the profile tolerance chart. The same procedure can be followed to determine the positions of the pitch diameter and the outside diameter on the chart.

On production gears, tooth spacing is usually checked by a tooth-to-tooth type of checking machine. Since several of the most critical gears are held to a tooth-to-tooth error of not over 0.0002 inch, it is obvious that the checking machine must function almost perfectly if it is to pass gears to this limit. Fig. 5 shows a gear mounted in a Red Ring spacing checker made by the National Broach & Machine Co. The inspector moves the lever marked *A* to advance the gear one tooth and obtain a reading on the dial indicator. It will be noted that the gear is held by a spring-loaded finger *B* against a fixed tooth *C*. The movable finger *D* touches an adjacent tooth and actuates the dial indicator. Any variation in spacing from tooth to tooth is indicated by the dial-indicator readings.

To obtain perfection in the spacing check, it was found necessary to use a constant spring pressure to hold the gear against the stop *C*. Also, it was necessary to advance the gear mechanically from tooth to tooth rather than by hand. The human element had to be eliminated before consistent checks could be obtained.

Comparative tests on different types of checking machines may be required to determine the reason why a gear does not come within the specified limits and to ascertain the contributing cause. Fig. 6 shows a detailed study of a rejected pinion. The original test, made on a Red Liner machine, showed two bad wobbles, although the total gear eccentricity was not excessive. The pinion was rechecked on a Red Liner machine with a more sensitive recorder and several additional wobble spots were found. An accumulated error check was then made of the left-hand side of the tooth with a dividing-head type of machine. Then a tooth-to-tooth spacing check was made of both sides of the teeth. One side of the teeth was found to be seriously in error, while the other side was reasonably good.

In addition to checks on the accuracy of tooth profile and spacing, spur gears must be inspected to determine if the teeth are parallel with the axis of the gear, while helical gears need to be checked for the trueness of the helical spiral. A Red Ring lead comparator is employed for making the latter type of test. A master cylinder

with grooves ground to the exact lead of the helix on different gears is used to guide the checking finger in a helical motion. The error in helix angle is read directly on a dial indicator.

In setting up a gear for checking the helix angle and concentricity, the gear should be revolved about the axis upon which it will run. Frequently a piece is bored, machined with centers in each end, and has several diameters on which bearings may fit. It is important that the engineer decide which is the critical axis of the part and then specify tolerances with respect to this axis. On aircraft gears made by the General Electric Co., this axis is called the "reference axis" and is specifically defined on each part. Adapting fixtures, such as the one shown in Fig. 5, often have to be made, in order to permit the part to be checked on its reference axis.

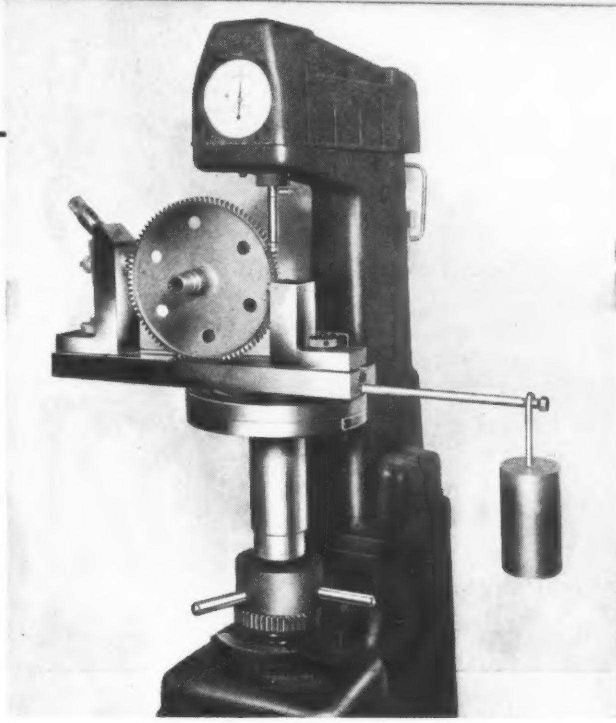


Fig. 8. Special Fixture Used in Conjunction with a Hardness Tester to Determine Hardness at the Center of a Gear Tooth

How Internal Gears and Splines are Inspected

In planetary gearing, the internal gear must be manufactured to high precision. If it (or any of the other gears in the train) should have a large amount of accumulated error, the load would not be divided equally between the gears.

On spline couplings also, accumulated spacing errors must be held to close limits to permit the splines to function properly. If the accumulated error is excessive, the teeth will either bind in some places or some of the teeth will fit loosely and will not carry their proper share of the load.

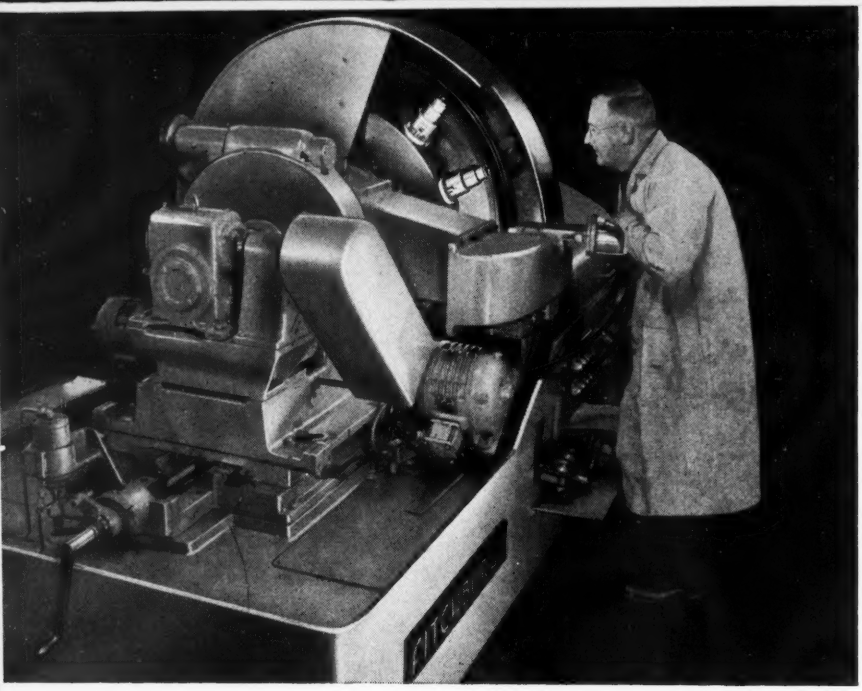
A new type of internal checking machine has been built by the National Broach & Machine Co. to permit a precision check of the tooth spacing, helix angle, and concentricity of internal gears and splines. This Red Ring gear checker is shown in Fig. 7. A precision index worm and gear are used to rotate the table. A dial arrangement permits settings to be made to one-thousandth of a degree. To check the tooth helix angle, the table is rotated a fixed amount while the checking finger is being lowered a proportionate amount. Thus, the indicator pointer can follow the helix point by point.

Small internal splines can also be checked on this machine. However, routine production checking of internal splines is done with gages. A "Go" gage can be used to check the tooth spacing, size, and profile. A block check between pins will detect pieces that are too small. When a close fit is required at the root diameter of the gear, a "paddle" gage having thin teeth is used for testing. Some gears from each lot are given additional checks for accuracy of spacing and helix angle, and the root and tip radii are measured on a Bausch & Lomb optical comparator.

Determining Case Depth and Hardness

All aircraft gears are carburized, and it is necessary to control the hardness and thickness of the case within close limits if full tooth strength and wear resistance are to be obtained. Usually a variation of 0.0015 inch is all that is permitted in the depth of a carburized case. Pieces of the same material as is used for the gears are carburized at the same time as the gears and the case depth is accurately measured.

After the gears have been heat-treated and finish-ground, final hardness checks are taken. A device is used that makes it possible to check the hardness of the tooth in the middle of the profile instead of on the top or the end of the tooth as is commonly done. Since the middle of the tooth is the most critical part from the wear standpoint, a hardness reading in this location is the most valuable. Fig. 8 shows one of the special fixtures being used with a hardness tester to make a Rockwell 30N reading of a tooth surface. Additional hardness tests are made on the gear web and hub (not usually casehardened), and on any integral splines of the gear.



Tooling for Grinding

Methods Used in Setting Up "Consta-Contac" High-Speed Automatic Grinding Machines for the Production of Ball and Roller Bearing Races, Automotive-Engine Valves, Valve-Seats, Pistons, and Cast Socket Wrenches

MAXIMUM production with minimum handling of work is the aim of all production engineers. This objective on the part of those responsible for planning machining and metal-working operations in mass-production shops has been responsible for the design of many of the automatic machine tools now in general use or under development. One of the newest of such machines is the Van Norman-Fitchburg Consta-Contac grinding machine built by the Van Norman Co., Springfield, Mass.

First developed for continuous grinding of automotive-engine valves, it has been adapted to grind the outside diameters of ball and roller bearing races, automotive pistons, piston-rings, socket wrenches, and other parts made of aluminum, cast iron, cast steel, and alloy steel. Some of the parts for which the machine has been tooled are shown in Fig. 1. Work up to 10 inches in diameter and up to 7 inches wide can be handled without difficulty. The minimum dimensions of work that can be ground depend, of course, on the design of the part; from the standpoint of the machine, the practical limit might be a part 1/4 inch in diameter and 1 inch long. At the other extreme is a part 10 inches or more in diameter, but as larger pieces seldom are required in quantity, this does not represent a limitation in the capacity of the machine.

The grinder, shown in the heading illustration, is a cylindrical machine so designed that several pieces—from three to five—are being ground to size at the same time. Continuous grinding machines are not new, but this one is unique in that it has a variable feed arrangement and can be set up so as to "wipe" the surface of the work across the face of the grinding wheel.

A vertical, ring type grinding wheel (*A*, Fig. 3), 42 inches in diameter and wide enough to accommodate the part being ground, is mounted on a driving head that operates at 550 R.P.M. The wheel is driven through V-belts by a 15-H.P. constant-speed motor. Parallel with the wheel is a work turret *B* carrying twelve spindles, one of which is seen at *C*. These spindles are driven through a friction drive by a 1-H.P. auxiliary motor.

The head on which the turret is mounted can be pivoted around a point at the back of the machine so that the turret face can be placed in a plane at an angle to the face of the grinding wheel. This angular setting can be varied from 0 to 3 degrees and controls the feed of the work. The work turret can also be offset with respect to the center line of the wheel any amount up to 3 inches. Thus when the work contacts the grinding wheel, it is fed into the wheel a distance equal to the amount of material that is to be removed, as well as across the face of the wheel a distance equal to the amount of offset of the turret. The result of this wiping action is that the grinding wheel wears evenly.

When the grinder is in operation, the work is automatically loaded on the spindles of the turret by suitable work-handling devices, carried around by the turret until it is ground and "sparked out," and unloaded on a conveyor belt that carries it away from the machine. The friction feed of the spindles is so designed that the rotation of each spindle is stopped when the part has been ground to size, after which the collet

High Production on Automatic Machines

chuck releases the work. These movements are accomplished by stationary cams, which are located in the center of the turret drum and actuate the collet and friction drive at a preset point in the operating cycle. A cam follower simply raises the friction-drive wheels until they no longer make contact, and a similar mechanism unloads the collets. Loading and unloading points can be adjusted for different types of work. The speed of turret rotation is varied according to the part being ground. However, as each machine is tooled up for a particular product, the speed of the machine is fixed once it has been placed in operation.

The automatic loading and unloading devices are auxiliary equipment which must be designed for each job. With ordinary equipment, one operator can handle five to six machines. One installation in an automotive plant is entirely automatic in operation. Valves are brought to the machines by an overhead conveyor, loaded on the work-spindles by the handling equipment incorporated in the machine, ground to size, unloaded, and carried by a conveyor belt to the motor assembly area. Each machine is equipped with an electric device that counts the number of finished pieces and automatically stops the loading mechanism after a specified number have been ground. At this point, an automatic truing device (*D*, Fig. 3), which is standard equipment on all machines, trues the wheel, and then the loading mechanism is again automatically started. For this particular application, it was found that the grinding wheel would have to be dressed after every 200 pieces were finished—or every five minutes in terms of production time.

Truing is accomplished by a hydraulic device mounted on the turret. When the diamond truing tool is in use, electrical interlocks interrupt the loading of the turret, putting it back in operation after the wheel has been trued to shape. A compensating vernier scale is incorporated in the mounting of the truing tool, so that it can be set in the correct relationship with the grinding wheel regardless of the angularity of the work turret. The amount of abrasive that is removed by each truing operation is governed by the setting of a ratchet and pawl, which controls the operation of the hydraulic cylinder that actuates the diamond tool.

In Fig. 4 is shown the set-up for grinding automotive-engine valves. The work turret is set at an angle of 46 minutes to the grinding wheel, which is beveled at the edge so that the valve-seat can be ground to a corresponding angle. The valve comes in contact with the grinding wheel just before it reaches the vertical position in the turret. As the turret rotates, it carries the valve downward, feeding it across the beveled face of the wheel. The wiping action, which removes burrs from the work and also prevents grooving of the wheel, takes place because the turret is offset approximately 1/4 inch with the center line of the grinding wheel.

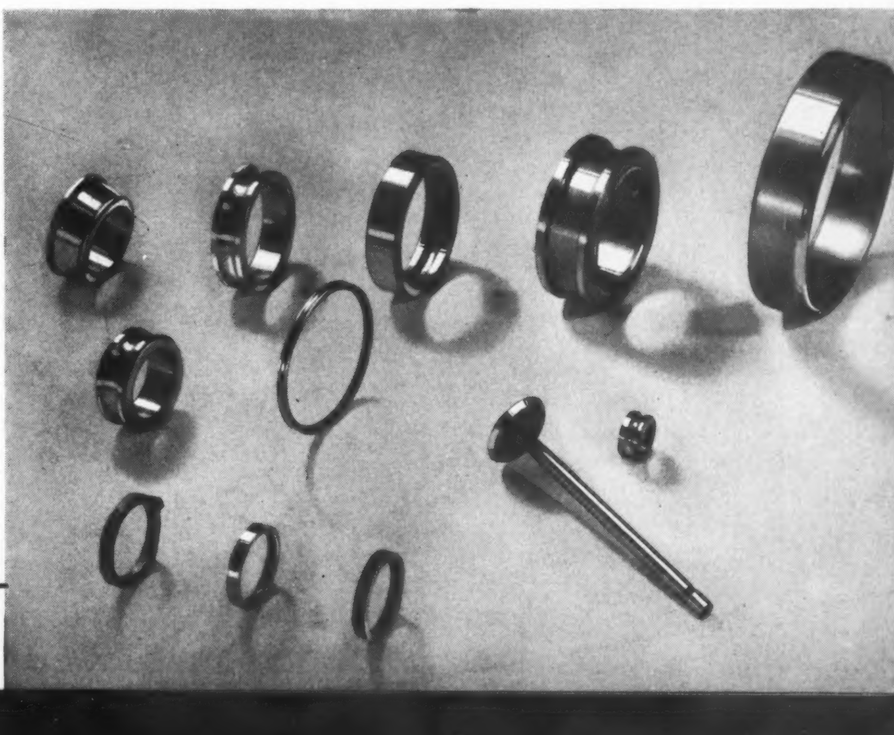
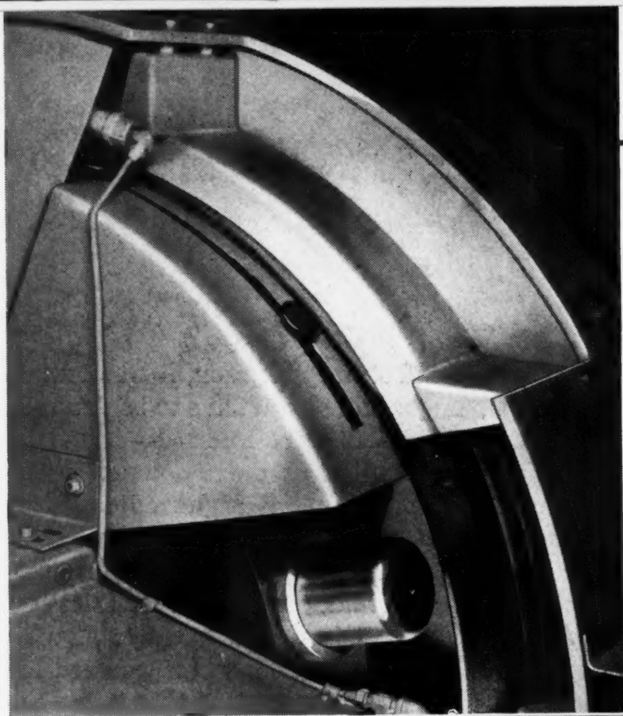


Fig. 1. Typical Parts that can be Ground on the Consta-Contac Grinder are Tapered and Spherical Ball and Roller Bearing Races, Valve-seats, Valve-stems, and Valve-seat Rings



TOOLING FOR AUTOMATIC

If a particular valve has more or less than the average amount of stock to be removed, it comes in contact with the grinding wheel either ahead of or behind top center, proportional to the variation in size. Thus, no adjustments are necessary to compensate for discrepancies in valve diameters. The production rate on this job is 2160 valves per hour with a stock removal of 0.005 inch.

More than one set of work-spindles can be used on each machine, so that it can be tooled up

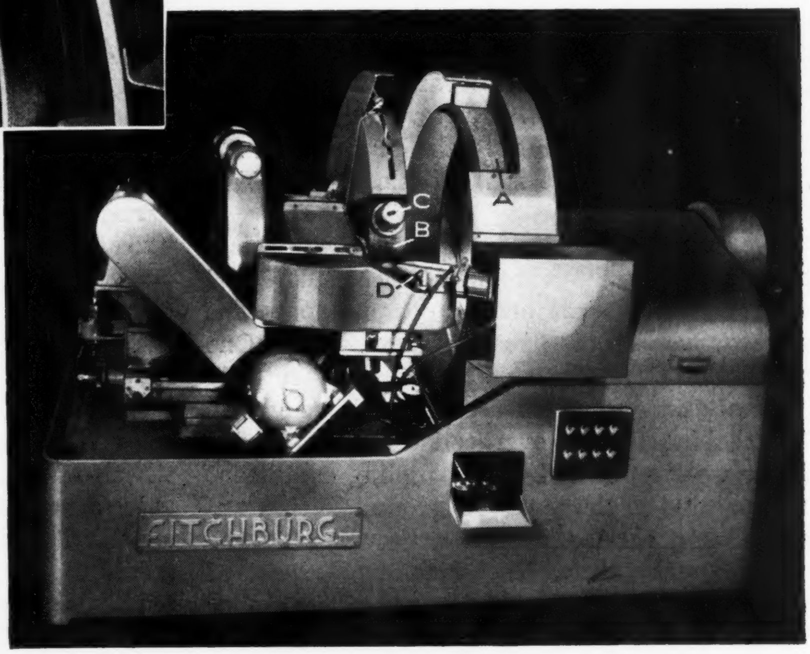


Fig. 2. (Above) A Close-up of the Work Turret Taken from the Back of the Machine Shows How Automotive-engine Valves are Mounted in the Chucks

Fig. 3. (Above) General View of a Consta-Contac Grinding Machine Set up for Finishing Automotive-engine Valves

Fig. 4. (Left) Diagram Showing the Set-up for Grinding Automotive-engine Valves. Cross-hatched Portion of Sketch Represents Path of Valve across Face of Wheel

Fig. 5. The Casting Gate of the Valve-seat Ring is Snagged Off and the Outside Diameter of the Ring Finish-ground at a Rate of Approximately 900 Parts per Hour

for similar parts of different size by merely inserting spindles of the required size, locating them in the proper position with respect to the grinding wheel, and tightening two lock-screws.

Another example of the type of job for which these machines are practical is a tapered steel roller-bearing race that must be ground on the outside diameter. The turret is set at an angle of approximately 56 minutes with the plane of the grinding wheel, and the speed of the work-spindles is 260 R.P.M. About 0.010 inch of material is removed from each bearing, production being at the rate of 1200 pieces per hour. As in the valve-grinding operation, the wheel is beveled along its outer face for this piece.

The set-up for a part somewhat more difficult to grind is shown in Fig. 5. In operations previously described, the section of the work that had to be chucked—either an inside bore or the outside of a shaft—was finished in a former operation. But this cast-steel valve-seat ring, about 1 1/2 inches in outside diameter and 7/32 inch wide, is received in an unfinished condition. It is first mounted on a rubber chuck that centers it accurately on the work-spindle, regardless of the rough bore. The center line of the turret is located 1 inch ahead of the center line of the grinding wheel, so that the casting is fed down across the face of the wheel. As this action occurs, the casting gate is snagged off and 0.030 inch of material is removed from the outside diameter of the part. Production per hour totals 900 pieces.

If so desired, an elliptical or eccentric part can be ground on the machine. The piston shown in Fig. 6 is approximately 0.020 inch less in diameter through the minor axis than through the major axis. The wheel is a medium-grit vitrified wheel with a face width of 5 inches; it operates

Fig. 6. By Mounting the Work-spindle in an Eccentric Quill and Revolving the Quill at Twice the Speed of the Spindle, Automotive Pistons are Ground to a Slightly Elliptical Shape

Fig. 7. The Stem of Automotive-engine Valves can be Grooved and the End Beveled by Using a Form-dressed Grinding Wheel. Either Diamond-dressing or Crush-dressing is Practical

at 5500 surface feet per minute. The work rotation is 125 R.P.M., and the angularity of the work turret with the wheel is 46 minutes. A surface finish of 12 to 15 micro-inches is obtained at a production rate of 600 pieces hourly.

To obtain the required eccentricity, the work-spindles are mounted in power-driven eccentric quills. These quills rotate at twice the speed of the spindle, so that, after every 180 degrees of rotation, the work-spindle is gradually fed into the wheel a distance of 0.010 inch.

Form-grinding, of course, can also be performed on the machine, Figs. 7 and 8 showing set-ups for typical operations. Fig. 7 illustrates the grinding of an automotive valve-stem, and Fig. 8 the grinding of a spherical roller bearing race. In both cases the grinding wheels are dressed to shape with a diamond tool. The production rate on the valve-stem is 1500 pieces per hour, and on the bearing races 1200 per hour.

Since there never are less than three parts in contact with the grinding wheel, the production time on any part can be very easily computed. This is done by multiplying the number of parts in contact with the wheel (3 to 5) by the number of seconds per hour (3600) and dividing by the sparking time of the part when finished on an ordinary cylindrical grinder. Thus, if four parts are to be in contact with the wheel and the sparking time normally is ten seconds, the production rate on this part would be 4 times 3600 divided by 10, or 1440 parts per hour.

Fig. 8. A Diamond-dressed Resinoid-bonded Wheel is Employed in Form-grinding Spherical Ball Bearing Races to Size

Advanced Machining and Welding Methods in a Car-Building Shop

Car-Wheel Boring Machines with Rotating Tools, Hydraulic Lathes that Simultaneously Rough- and Finish-Turn Axles, and a Huge Spot Welder are Among the New Machine Tools Developed by Pullman-Standard Car Mfg. Co. to Increase Efficiency in Production

WORN-OUT freight cars are being retired from service at the rate of 5000 a month. Car builders have been engaged in a comprehensive modernization and retooling program, in order to replace such urgently needed rolling stock and expand the nation's facilities for peacetime transportation. A few of the machines developed by the Pullman-Standard Car Mfg. Co. to increase efficiency in producing such cars are here described.

A new type of car-wheel boring machine, Fig. 1, with a capacity more than ten times that of pre-war boring mills, has been installed in three of the Pullman-Standard plants. Taking full advantage of carbide-tipped tools, the machine feeds a rotating boring tool into the hub of a stationary car wheel, instead of employing the conventional method of rotating the wheel under a stationary tool. It has generally been believed that the latter practice was necessary in order to bore a hole concentric with the outside circumference, as is done in lathe and boring mill work. The results accomplished with the present machine, however, have disproved the need for this practice.

By finishing the wheel in one operation and using a shifting table, which allows loading and unloading of wheels while one is being bored, the machine is capable of turning out forty-three or more steel or chilled-tread cast-iron wheels an hour, as compared with three and one-half wheels an hour on a single old type boring mill. Formerly, it was necessary to employ six boring mills on a full-time schedule to supply wheels for the fifty-four cars produced daily in any one of the company's three freight car plants.

The machine is provided with a gear-driven spindle to carry a boring-bar equipped with tools to machine the wheel bore and a starting chamfer. The chamfer facilitates pressing the wheel on the axle. The spindle speeds can be changed to bore either cast-iron or steel wheels. There are two five-jaw chucks for the wheels on a table which automatically shuttles from the working position to the loading and unloading position at the right or left. These chucks are seen in Fig. 2. Loading and unloading are facilitated by an automatic wheel-lifting device, Fig. 3, which is used to swing a bored wheel from the table and replace it with one to be bored. When the table shifts to place the center of a wheel under the boring-bar, the travel is "cushioned" to a stop, and a lock-pin is forced up into the table to secure it in the exact central position. The closing and opening of the self-centering chuck jaws are accomplished by means of a lever that actuates a hydraulic cylinder.

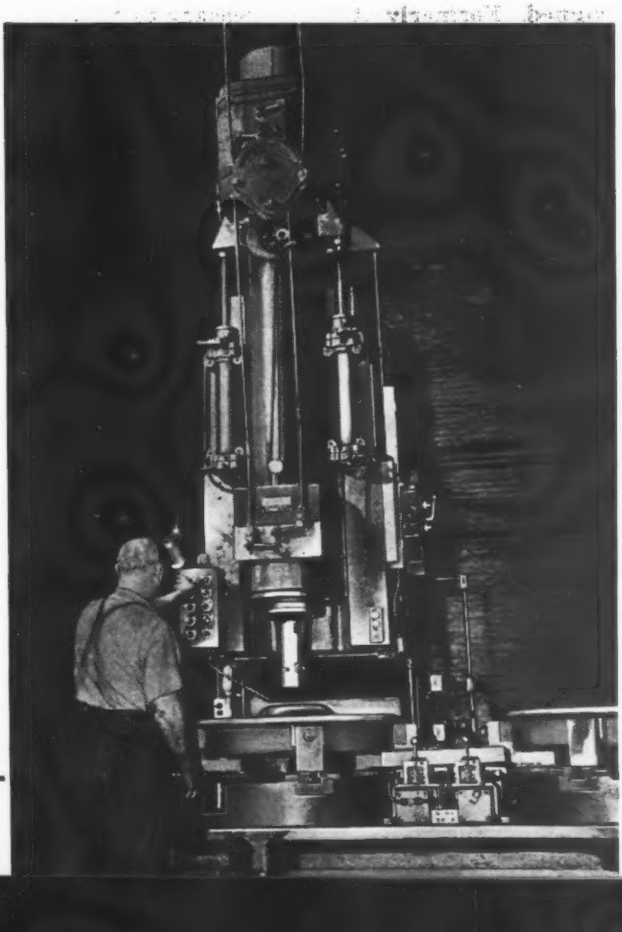


Fig. 1. Railroad-car Wheel Boring Machine which Employs a Rotating Carbide-tipped Tool, and Bores More than Forty-three Cast-iron or Steel Wheels per Hour

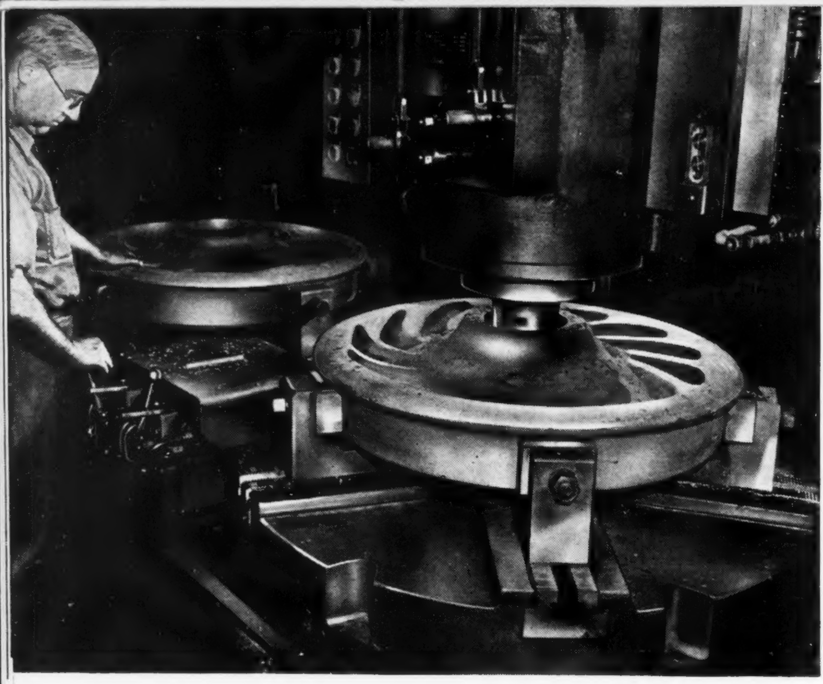


Fig. 2. A Car Wheel is Held Stationary during Boring Operation by a Five-jaw Self-centering Chuck that is Actuated through a Hydraulic Cylinder

Automatic control of the spindle permits the boring-bar to be rapidly fed to the cutting position, where the hydraulic traverse is reduced to a feed of 0.040 inch per revolution, a speed of 136 R.P.M. being used for forged-steel wheels. After the boring tools complete their travel through the wheel, a chamfering tool feeds down for approximately 3/4 inch, where there is a slight dwell. Then the motor circuit is interrupted and the boring-bar recedes rapidly through the bore, coming to rest in its upper position.

To match the production of this wheel-boring machine, a hydraulic lathe which rough- and finish-turns the journals on both ends of railroad-car axles in one operation has been designed. Formerly, it was necessary to rough and finish these journal surfaces in subsequent operations. Axles are now both rough- and finish-turned on this lathe at the rate of about twenty-five per hour—more than twice that previously obtained on two machines. Burnishing of the axles is done on a second machine.

The lathe employs two back and six front carbide-tipped tools on both ends of the axle. Back-up rolls are also provided at both ends. The pressure exerted by these rolls on the axle can be adjusted to eliminate any taper, which is undesirable for assembling the wheels on the axle. Four spurs, each, on the spindle nose and tailstock are hydraulically pressed into the end faces of the axle to turn it at 140 R.P.M. The tools are fed across the work at 0.060 inch per revolution and remove about 1/2 inch of stock from the several diameters turned.

The huge, multiple spot-welding machine shown in Fig. 4 is in operation at the Chicago plant of the company, where it has increased production about thirty times. The machine is used primarily to weld stiffeners of light-gage corrugated metal to the interior of car sides.

In operation, a steel table 30 feet long and 10

Fig. 3. Automatic Wheel-lifting Device for Loading and Unloading Car Wheels Held on Sliding Table of the Boring Machine Illustrated in Fig. 1

Fig. 4. Stiffeners are Welded to the Interior of Car Sides on This Huge Spot Welder which Employs Forty-eight Electrodes

feet wide travels beneath a battery of forty-eight stationary welding electrodes. The work to be welded is laid flat on the table, which has been covered with a copper plate. As the table moves slowly beneath the row of spot-welding electrodes, it is adjusted to stop at certain intervals, and the electrodes are automatically lowered, make contact with the work, complete a weld, and return to the starting position.

A unique electric-eye arrangement makes the operation entirely automatic. Along one side of the table are drilled two rows of small holes about 1/4 inch apart. The electric-eye beam is directed from beneath the table through these holes. When the beam strikes a photo-electric cell located above the holes, the circuit which stops the table and actuates the electrodes is completed. By dropping loose rivets into the holes not needed in the operation, the welding positions are preset. The table moves along smoothly until an open hole passes over the light ray, setting the welding process into operation.

Sellers Started Building Machine Tools One Hundred Years Ago

William Sellers, a native Pennsylvanian, started to build machine tools in Philadelphia during the year 1848, as a result of which Roe's "English and American Tool Builders" pays him this tribute: "Probably no one has had a greater influence on machine tools in America than William Sellers."

Mr. Sellers invented or improved many of the fundamental machine tools which made possible the locomotive, the harvester, the printing press, and the automobile. One of his best known machine inventions is the spiral-gear planer drive, which was patented in 1862 and is still in use on present-day planers. He formulated standards for screw threads, and had he done nothing more than this he would have made an outstanding contribution to the machine-building and metal-working industry. His screw-thread standard

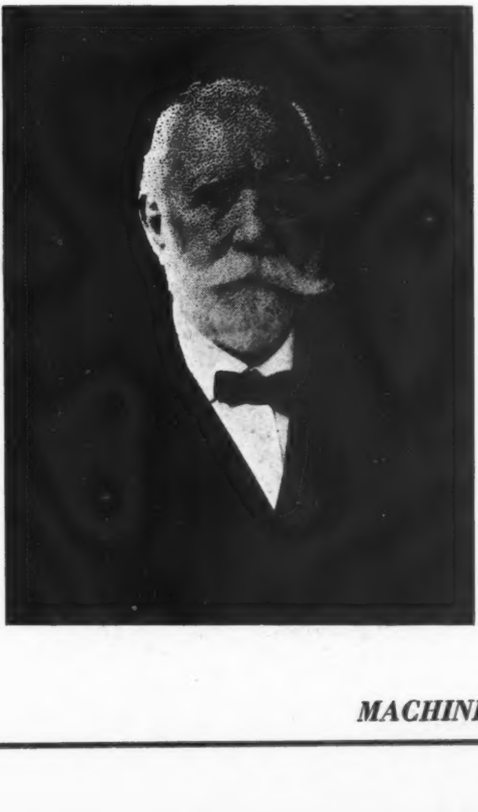


Fig. 1. William Sellers (1824–1905), Who Opened a Machine Shop in 1848, which Became the Forerunner of William Sellers & Co.

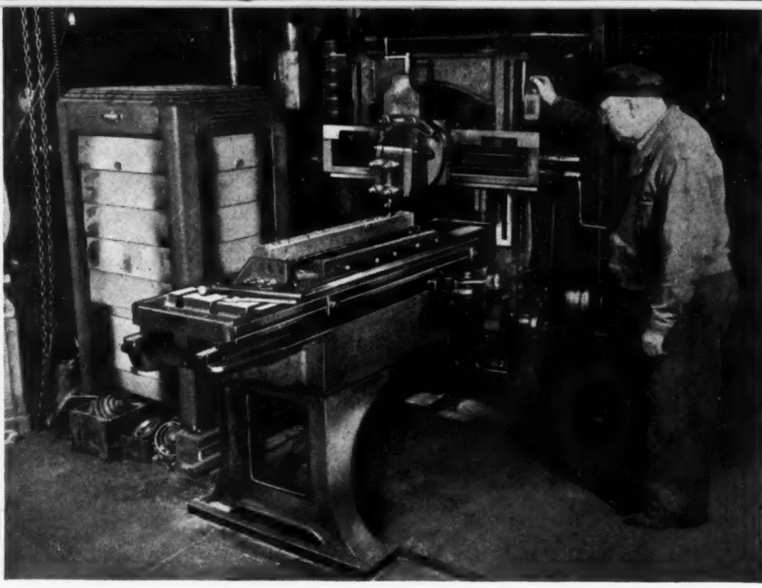


Fig. 2. One of the First Machine Tools Built by William Sellers—a 24-inch Planer Now Ninety-nine Years Old, which is Still in Production and Doing Accurate Work

was first known as the Sellers Standard Screw Thread—later called the "U. S. Standard Screw Thread." Because of his achievements, Sir Joseph Whitworth characterized Mr. Sellers as the world's greatest mechanical engineer of his day.

Not content with the rapid and successful growth of his machine tool company, Mr. Sellers organized and became president of the Edgemoor Iron Co. He developed many new machines for this company, which furnished all the structural steel for the Centennial Exhibition in 1876 and for the famous Brooklyn Bridge.

In 1873, Sellers also became president of the Midvale Steel Co., for which he developed and improved many machines for the production of heavy forgings and other products. Under his sponsorship, Dr. Frederick W. Taylor began, in 1880, his epoch-making research in the art of cutting metals. For over twenty years, William Sellers backed this research at a cost of well over $250,000, which in those years represented many times the present-day value.

William Sellers & Co.'s reputation for building heavy machine tools for railroad shops is credited to the founder's second cousin, Coleman Sellers, who became chief engineer of the company. Much of the fundamental design work of the Niagara electric power project was also done by Coleman Sellers, who was a physicist, an expert photographer, telegrapher, and microscopist.

Today, William Sellers & Co. is a division of the Consolidated Machine Tool Corporation, Rochester, N. Y., which is comprised of eight former major machine tool companies. The Sellers line includes railway tools, such as lathes for turning car wheels and locomotive driving wheels; driving-box boring and facing machines; and locomotive-frame slotters. Other machine tools include large horizontal boring, drilling, and milling machines; double-housing and open-side planers; boring and turning machines; plate planers; turret-track turning machines for work up to 40 feet in diameter; drill and tool grinders; and special machines.

Fig. 3. Plant of the Consolidated Machine Tool Corporation, Rochester, N. Y., where the William Sellers Lines of Machine Tools are Now Built

Only with Production Equipment Can Europe Help Itself

SOME months ago it was pointed out in an editorial on this page that if the countries of Europe are to really help themselves out of the economic morasses in which they have become bogged, it is essential that they be provided with adequate manufacturing facilities. So far, food, clothing, tobacco, and raw materials have been shipped to them in large quantities. It is now time to send machine tools and other metal-working equipment, so that the European factories can, themselves, produce agricultural and automotive equipment, mining machinery, railway rolling stock, and so on.

Many manufacturing plants in the countries abroad need such equipment desperately. In fact, it has been estimated that there are now blocked orders to the value of $125,000,000 for machine tools alone. The trouble is dollar shortage—credits must first be established in the countries that want to buy American production equipment. Definite sums of money available under the Marshall Plan must also be allocated for the purpose by the countries themselves.

Plans for the establishment of credit are apparently nearing a successful conclusion, as Washington authorities have requested the National Machine Tool Builders' Association to take the initiative in stimulating action to increase the production facilities of those countries that are to share in the benefits of the European Recovery Plan.

Three representatives of that Association have accepted this invitation and will attend conferences soon to be held in Europe with European industrialists and officials of the Economic Cooperation Administration. The N.M.T.B.A. representatives are Alexander G. Bryant, Tell Berna, and Milburn A. Hollengreen, president, general manager, and chairman of the Government Relations Committee, respectively. Efforts will also be directed at the conference toward allocating dollar credits specifically for the buying of machine tools.

Complete success in attaining these objectives is to be hoped for; otherwise, the European Recovery Plan may degenerate into a gigantic relief program instead of stimulating economic recovery. Relief programs do not build up individual or national morale, as we well know from depression days. Men the world over want the chance to provide for themselves and their families. They can do so if factories everywhere are placed in full production.

It is by the development and application of high-production methods that the United States has achieved its enviable position in world economy; the nations we are trying to help should be given the opportunity of benefiting from our experience. American taxpayers will quickly rebel against spending billions of dollars for recovery abroad if the Europeans are not really given the chance to help themselves "production-wise."

Charles O. Herb
EDITOR

Impact Extrusions—Their Design

Factors to be Considered in Designing Impact Extrusions and Tolerances Recommended — Second of Two Articles

THE first installment of this article, published in August MACHINERY, page 147, dealt with the advantages and limitations of impact extrusions, production methods, and applications. This installment will discuss the design of impact extrusions, including production considerations and recommended tolerances.

Production Considerations Affecting Design

As with all other processes, certain production considerations tend to influence the design of impact extrusions, and the more the designer knows about production methods, the better he can adapt the part to be made at minimum cost. Tooling, for example, is less costly when all surfaces of the extrusion are round and when no eccentric or non-circular lugs are specified on the bottom. Under these circumstances, the die and punch can be made by simple turning, boring, and grinding operations.

Some makers of impact extrusions have adopted standard diameters and wall thicknesses for tubes and cups and certain other dimensions relating to length, thus avoiding the cost of special tools. Length can be varied within certain limits by merely using a different thickness of slug or by allowing for changes in thickness of the bottom or flange.

Although off-center lugs are feasible, central lugs on the bottom are preferred. There is then less tendency to throw the punch off center and thereby vary wall thickness by making the bore of the extrusion eccentric. It is better from a production standpoint to have more than one lug and to have the lugs symmetrically placed rather than to use a single eccentric lug.

Minimum Wall Thickness of Tubular Portions of Aluminum Impact Extrusions

Outside Diameter of Extrusion, Inches	Type of Material	
	2S	51S, 53S, and 61S
3/4	0.010	0.094
1	0.015	0.094
1 1/2	0.020	0.094
2 to 2 1/2	0.020	0.125 to 0.187
3	0.025	0.125 to 0.187
3 1/2	0.025	0.219 to 0.281
4	0.030	0.219 to 0.281
4 1/2	0.040	0.219 to 0.281
5	0.075	0.219 to 0.281

As the bottom of the extrusion thins out, friction between the die wall and the punch increases; hence, too thin a bottom should not be specified. In general, the thinnest bottom that is feasible is about 0.030 inch. This minimum, however, may have to be greater for certain metals, especially those subject to rapid work-hardening.

Side walls approximately 0.004 inch thick are common in making collapsible tubes, and walls only 0.003 inch thick have been produced, although they are not generally considered commercially feasible. Such thin walls are not strong, and any slight deflection of the punch from a true concentric position makes the wall on one side exceedingly thin. Side walls can be as thick as desired if the press has sufficient capacity to make the metal flow and the slug has adequate volume. The minimum wall thickness increases as the hardness of the wall increases and as its ductility decreases. Approximate minimum wall thicknesses for aluminum impact extrusions of various diameters are given in the accompanying table. Walls somewhat thinner than those indicated can be extruded if presses of sufficient capacity are available. Walls as thin as 0.004 inch can be made in collapsible tubes up to 3/4 inch in diameter where aluminum of at least 99.7 per cent purity is available.

Since the punch commonly acts as a column that is suddenly and heavily loaded, it must have sufficient strength and rigidity to resist bending. Pressures as high as 200,000 pounds per square inch are necessary in extruding some aluminum alloys. With the common type of die, the length of punch must be sufficient to care for the length of extruded tube to be formed, as the tube travels up the punch as long as extrusion takes place. In some cases, the punch is supported by a hinged plate so that it can be swung to one side while stripping.

As the stripping of the extrusion generally deforms the outer end of the tube, especially on thin-walled extrusions, allowance for cutting off the deformed length is commonly required. Some allowance for trim is needed anyway, as the extruded tube does not have a truly square end.

and Production

By HERBERT CHASE

The final length is controlled by the trimming operation.

With the Hooker type of die, in which the tube is extruded downward between a short punch and the die, the length of tube extruded is limited chiefly by the capacity of the press and the volume of the slug that can be extruded. A length of 12 to 14 inches is generally the maximum feasible. The length should not exceed that which it is practical to withdraw through the die unless the tube is to be cut off before normal ejection occurs.

As the end of the punch, in the common type of die, forms the inside of the cup bottom, it must be shaped accordingly. Often, the end is square but the edge must be either rounded or chamfered to facilitate the flow of metal upward around the punch. In other cases, the end of the punch is crowned or is made conical. A conical end facilitates metal flow and thus tends to reduce the power consumed and die wear. An included angle of 120 degrees is considered most favorable.

Punches often have central tapered projections that produce a blind or open hole and form the interior of a nozzle-like projection, as on some collapsible paste tubes. Any central conical projection helps to keep the slug from shifting and throwing the punch off center. The punch can have a recessed end to form an interior boss if required, but the recess should be central or symmetrical.

Where the bottom of the die joins the side wall, a fillet or bevel is essential to help deflect the metal that is extruded upward around the punch. Side walls should be given a very slight flare and are generally polished. Either the bottom of the die recess or the end of the punch is also polished to help flow of the metal.

Tolerances Recommended for Economical Production

On over-all length, the usual tolerance is $\pm$ 0.015 inch. This tolerance depends upon the (secondary) trimming operation, which is required to make the open end square and, when there is a nozzle-like projection, to trim off the end of this projection.

A common allowance for inside diameter is + 0.000 to 0.006 inch. On outside diameters, a tolerance of from $\pm$ 0.003 to $\pm$ 0.005 inch can usually be held, depending partly upon the nominal diameter. The closer limits are for small diameters—say up to about 1/2 inch—and the more liberal ones for diameters up to about 1 1/2 inches. Outside diameters sometimes have a slight taper—0.001 to 0.002 inch per inch.

Side-wall thickness tolerances range from about $\pm$ 0.0002 inch for walls 0.004 inch thick, to $\pm$ 0.003 inch for walls 0.014 inch thick. For bottoms, the thickness tolerance is between 0.003 and 0.007 inch, increasing from the lower toward the higher tolerance as the diameter of the bottom increases.

Eccentricity is commonly held within fairly close limits, partly because such variation as occurs affects the wall thickness. The limits are indicated by those on side walls, as given previously. A given eccentricity causes double its amount of variation in wall thickness.

General Rules for Designing Impact Extrusions

Although there are no well defined or unvarying rules for design, if those given below are followed, production difficulties can be minimized, with a corresponding tendency to lower costs. Many of these rules may appear fairly obvious, but they are not always observed, especially if the designer is not familiar with conditions surrounding production. For this reason, it may pay to check any new design against each rule to make sure that there is no violation that can be avoided or that if the violation appears necessary, the benefit gained is worth whatever extra cost it entails.

1. Size and weight of the extrusion should be kept at a minimum, consistent with other requirements and with reasonable ease of production. This tends (a) to minimize the amount of metal used; (b) to keep production rates high; and (c) to hold tooling costs at a minimum. Keeping the length of the extrusion at a minimum permits the use of a short, strong punch, and a light, fast press with a short stroke. Sections should not be so thin, however, as to handicap production. Down to a certain minimum (commonly about 0.004 inch for tubes of about 3/4 inch diameter) the softer and more ductile the material used, the thinner the walls can be. Some of the softer alloys, however, are low in strength and lack stiffness. Aluminum and its alloys, on the other hand, work-harden rapidly as a result of extrusion and become much stiffer.

This, in turn, limits wall thickness to the minimum given in the table, but yields the advantages of greater hardness.

2. Only sections that are circular, at right angles to punch axis, and symmetrical about this axis should be employed unless the disadvantages of some alternative are fully offset by any advantages secured. By following this rule, die costs are minimized and production is facilitated. Many non-circular sections are feasible, but they tend to increase die costs. Lack of symmetry may tend to throw the punch off center, thereby causing variations in wall thickness, and may result in other production difficulties.

3. When bottom bosses are required, they should be disposed symmetrically and should be circular in shape, with no sharp edges or corners. Recesses in the die or in the end of the punch are most easily machined when they are circular. Sharp edges and lack of fillets in recesses make it harder for the metal to flow. Lack of symmetry makes the metal flow unequal and tends to throw the punch off center. Bosses that are co-axial with the punch are preferable to eccentric bosses, but the latter are often used.

4. A fillet or bevel should be provided on the end of the punch and also at the junction of the side walls and the bottom of the die. A punch with a sharp edge would tend to cut or tear the metal and retard its flow, and a sharp corner in the die would also retard flow. The corresponding bevels or radii on the work add to its strength. With the Hooker type of die or with punches for making caps (in both of which the punch makes a close fit with the die), the edge of the punch can be square and the die need not have a fillet where the bottom and side walls join. There should be a fillet, however, where the extruded wall and flange come together.

5. When a nozzle-like projection from the bottom of the extrusion is required, ample taper should be provided, both outside and inside. Proportions similar to those for collapsible tubes are indicative of favorable practice. A good taper helps to strengthen the punch extension and also facilitates stripping the extrusion from the punch.

6. When flanges are required, their diameter should be held to a minimum, and their thickness should not be less than that of the tubular extruded wall. Keeping diameter and thickness at a minimum helps to save metal, and the smaller the diameter, the less the pressure required for extruding. With lower pressure, a smaller and probably a faster press can be used. Flanges should not be so thin, however, that excessive pressure is needed to cause the metal to flow in the flange. In general, flanges should be somewhat thicker than side walls.

7. The piece should be so designed that, consistent with proper performance of function, a minimum number of secondary operations is required. It is possible, for example, in making extruded caps, to use a punch with a threaded end and to force the metal into the thread and unscrew the cap from the punch by some automatic mechanism. This will save a secondary tapping operation. Most secondary operations are performed on arbors, and often two or more (such as trimming and bead rolling or knurling and threading) can be done at the same time. In such cases, the cost of an extra operation may be slight enough as to be negligible, but an extra tool is needed and the set-up and maintenance of the tool may not be negligible.

8. Before designing a new extrusion that requires special tools, the possibility of using a standard product, available from stock tools, should be investigated. It will save the cost and the delay incident to making special tools and may effect a net saving. When no satisfactory standard product is available, it may still be possible to follow the same general design and thereby insure getting an extrusion that can be produced economically.

9. Dimensional limits closer than those essential or than those that can be held on the mating part should never be specified unless such limits are known to be those commonly held without added cost. When no fits or clearances have to be held, only nominal dimensions need be given.

10. A metal that, in addition to possessing the properties required, will facilitate production at minimum cost should be selected. Ease and rapidity of working and of finishing ought not to be overlooked. Materials that work-harden rapidly may require an extra annealing operation that can be avoided if some other material is chosen.

11. Over-all dimensions must be held within the limits known to be feasible for the type of part needed. Parts up to 5 inches in diameter can be produced, but few presses of sufficient capacity for larger sizes are available.

12. Design and specifications should be checked with a producer before it is too late to make changes that may expedite production. Details that may seem inconsequential to the designer sometimes have a marked effect upon production costs. Producers usually can spot such details and suggest changes that will lower costs without affecting the utility of the product and that may even make the product serve its purpose better than it would without the change.

Planing Cast Iron with Carbide Tools

By GEORGE J. RAIBLE
District Manager
Kennametal, Inc.
Latrobe, Pa.

Fig. 1. Planing a Long Cast-iron Planer Table with a Carbide-tipped Tool, Using a 3/8-inch Depth of Cut and 0.045 Inch Feed at a Surface Speed of 150 Feet per Minute, Interrupted Cuts being Involved

FROM 3 to 4 cubic feet of cast iron can be removed from work between regrinds with a new type of planer tool developed by Kennametal, Inc., in cooperation with the Cincinnati Planer Co. and the G. A. Gray Co. Tools of this type are being used satisfactorily on heavy jobs involving deep cuts, coarse feeds, and interrupted cuts. Distinguishing features of these tools are the grade of carbide, the method of securing the tip, and the cutting angles.

The tip of the tool is Kennametal K1, a strong cast-iron cutting grade that was developed to provide higher resistance to impact and cratering action than was heretofore obtainable in machining modern types of cast iron at customary planer speeds—speeds that are usually lower than those available on lathes and boring mills. The tip is held mechanically to a hardened steel shank by means of a clamp and screw, and is backed up on the bottom and side by hardened steel shims to provide an assembly free from thermal strains.

To insure the strongest possible tool point, the tip is set to provide greater side rake, back rake, side cutting edge angle, and nose radius than are provided on tips of conventional turning tools. Also, a flat land is ground on the side cutting edge at 0 degrees side rake.

These tools can be used on the newer types of planers having a clapper-box lift of at least 3/8 to 1/2 inch (to avoid tool drag on the return stroke) and capable of being operated at high speed with adequate power. The planer must be

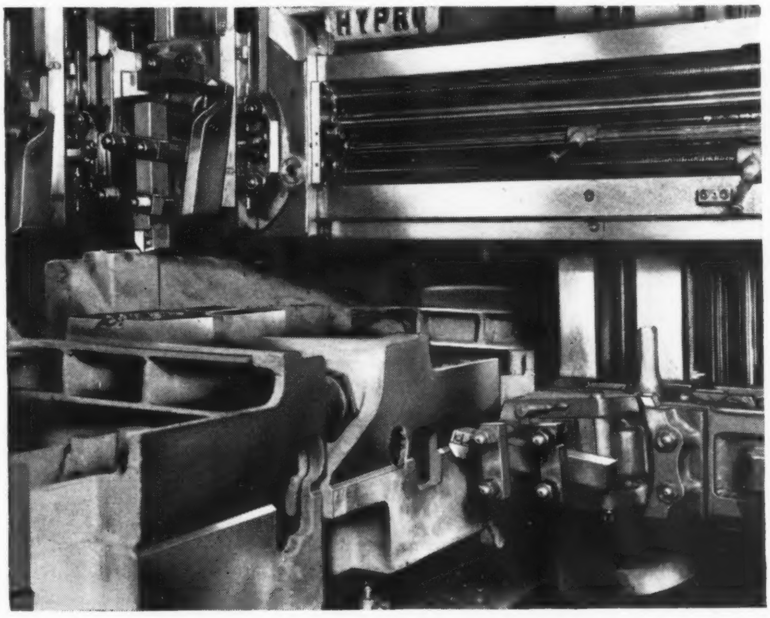


Fig. 2. Planing the Side and Top of Three Semi-steel Castings (40 Per Cent Steel) at a Surface Speed of 150 Feet per Minute, the Depth of Cut being 1/2 Inch and the Feed 0.080 Inch

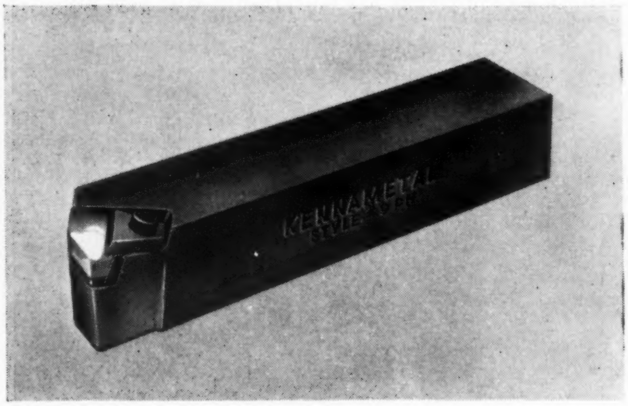


Fig. 3. Planer Tool with Clamped-on Carbide Tip Designed Especially for Straddle-facing to Square Shoulders

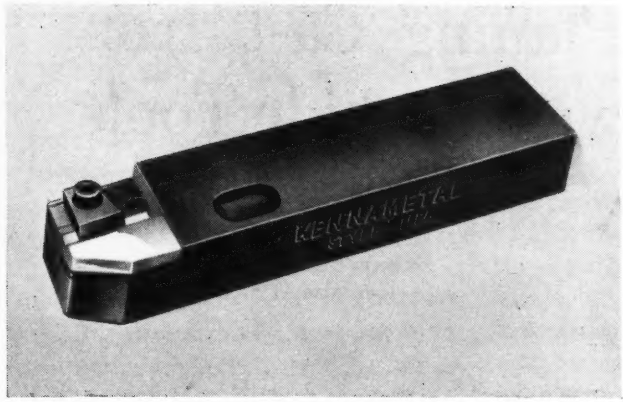


Fig. 4. Another Clamped-on Carbide-tipped Tool Designed for Vertical Planing with the Tool Held on a Side-head

in good condition, with the saddles snug all along the rail and with the clapper-box snug on the swivel-pins.

Fig. 3 shows the type of tool designed for straddle-facing to a square shoulder. A drawing of the same tool is shown at *A*, Fig. 5. At *B* is a detail drawing of the tip provided on this type of tool. Fig. 4 shows a tool designed for vertical planing with the tool mounted on a side-head; a drawing of this tool is seen in Fig. 6. A tool of opposite hand is suitable for horizontal planing when mounted on a rail-head. Shanks for tools of the types illustrated in Figs. 3 and 5 can be supplied in lengths from 12 to 18 inches and in depths from 2 to 3 inches.

Speeds ranging from 100 to 200 surface feet per minute can be used satisfactorily, depending upon working conditions. There should be a proper balance between the depth of cut and the feed and speed to secure the maximum rate of metal removal consistent with longest tool life. The speeds recommended for planing the three common grades of cast iron with various combinations of depth of cut and feed (based on experience) are given in Table 1.

Table 1. Speeds, in Surface Feet per Minute, Employed in Planing with Clamped-On Carbide-Tipped Tools

Depth of Cut, Inches	Feed per Stroke, Inches	Hard Cast Iron	Semi-Steel (40 Per Cent Steel or More)	Soft Cast Iron
1/2 to 1	1/32 to 3/32	130	130	150
1/4 to 1/2	1/32 to 1/8	150	150	175
1/8 to 1/4	1/32 to 5/32	160	160	200
0.015 to 1/8	1/32 to 3/16	180	180	225

Adequate power should be available to avoid stalling of the machine under the cutting load. Table 2 indicates the horsepower required for different combinations of feed and depth of cut when operating a planer at 150 surface feet per minute.

There are a few operating and maintenance precautions to be observed in using these tools. For example, excessive overhang of tools should be avoided. The feed should be disengaged and the planer permitted to make one complete cycle after disengagement of the feed before stopping the table movement. Also, tools should not be immersed in water for cooling purposes, either after use or after grinding. When the tool is being clamped tight on a planer head, it should be completely free from the work. Tools should be sharpened as soon as they start to become

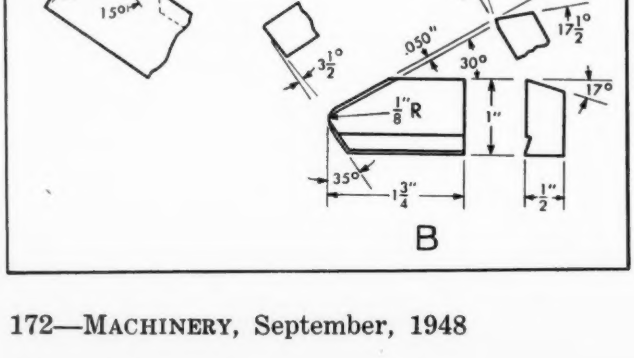
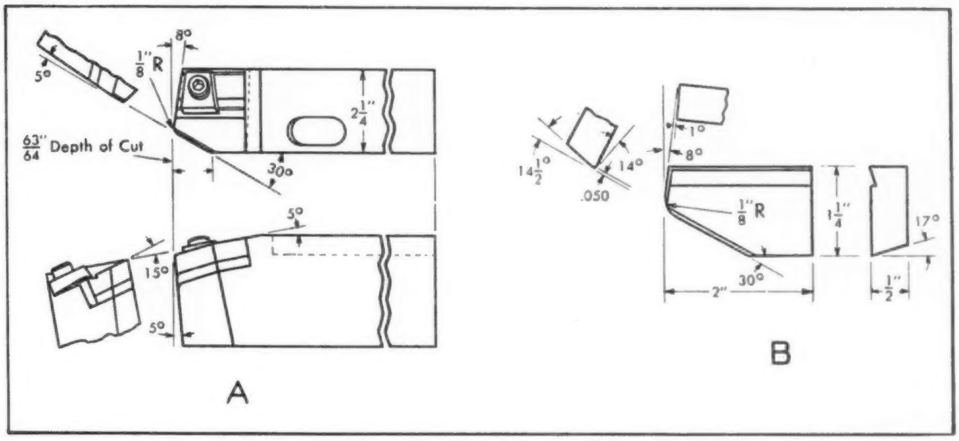


Fig. 5. (A) Design of Clamped-on Carbide-tipped Tool Shown in Fig. 3. (B) Detail of Carbide Tip for This Tool

Fig. 6. (A) Design of Clamped-on Carbide-tipped Tool Illustrated in Fig. 4. (B) Detail of Carbide Tip for This Tool



dull; it should be remembered that a tip can be resharpened in less than five minutes if removed from an operation at the proper time.

Because of the large size of these planer tools, it is not practical to sharpen the tips while held in their heavy shanks, and for this reason, a special grinding block has been developed, as illustrated in Fig. 7. This block permits either a right-hand or a left-hand tip to be ground on a carbide tool grinder of the cup-wheel, off-hand type. The block is of such a design that the side clearance, end clearance, and contour around the nose are properly formed with the work-table set at zero—that is, at 90 degrees to the wheel face. The proper side rake is formed on the land when the block is placed on its back.

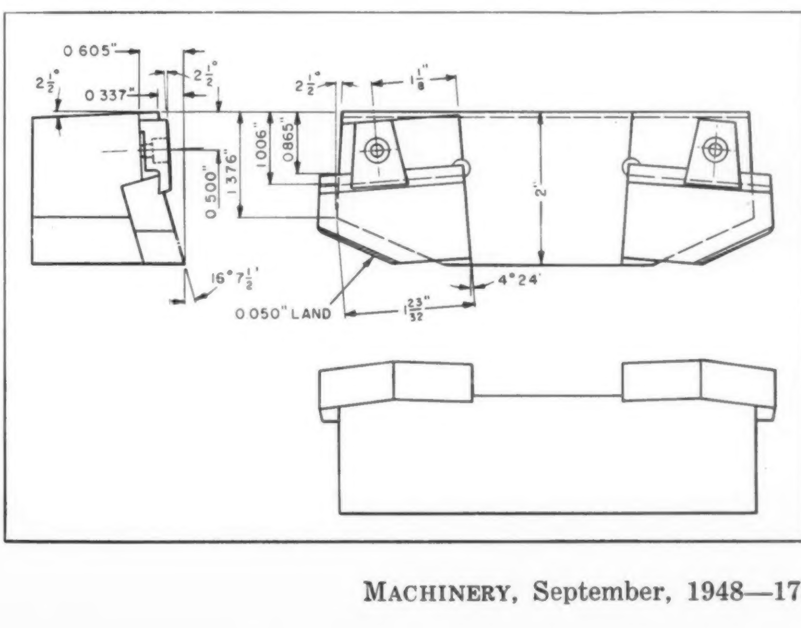
Table 2. Horsepower Required for Planing at a Speed of 150 Surface Feet per Minute with Different Feeds and Depths of Cut

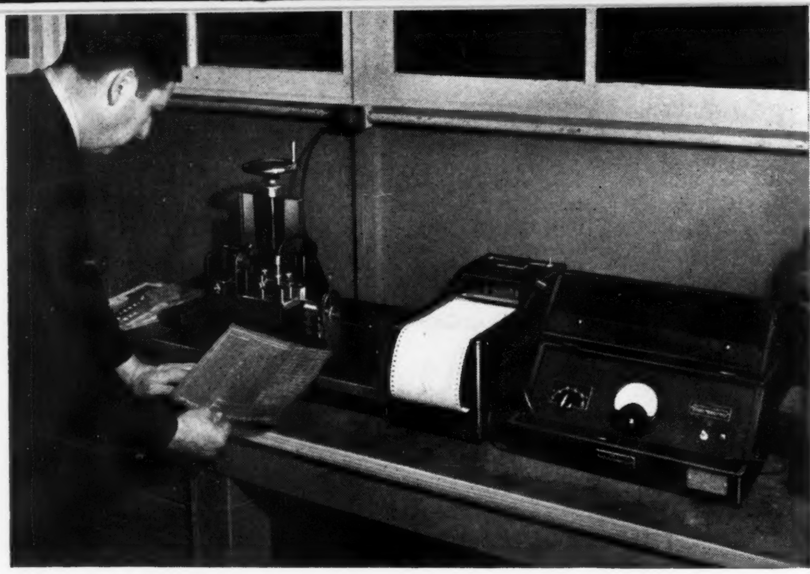
Feed per Stroke, Inches	Depth of Cut, Inches						
	1/4	3/8	1/2	5/8	3/4	1	1 1/4
	Horsepower at 150 Surface Feet per Minute						
1/32	3.5	5.25	7.1	9.5	12.0	14.1	17.7
1/16	7.0	16.50	14.2	17.7	21.6	28.3	35.5
3/32	11.0	10.50	22.0	28.1	33.0	44.2	55.2
1/8	14.1	21.20	28.3	35.5	42.7	56.7	71.0

These tools with clamped-on tips are, of course, intended for heavy roughing operations. Tools with brazed-on tips are suitable for finishing cuts, and for such cuts, the harder grade K6 carbide generally gives a longer tool life. On broad-nosed tools, it has been found that tools having a tip set to a 10-degree back-rake angle are especially satisfactory when the planer is run at 200 surface feet per minute with a feed of from 3/8 to 1 inch.

Other tools have also been developed for special uses, such as a clamped-on tip type for planing to sharp corners; a square-end brazed-on tip tool for "broad-nosing" when the feed per stroke is almost as great as the tool width; and a round-nose brazed-on tip tool for planing in a trough by plunging and feeding both ways.

Fig. 7. Block Designed for Holding Right- and Left-hand Carbide Tips while Grinding





How to

By J. F. FISCHER
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FOR many years, the only way surface quality was specified was by the use of vague classifications such as "rough," "rough commercial," "good commercial," "reflecting," "high," "ultra," and "mirror" finishes. Everyone had his own idea as to what these terms meant, since they did not define the degree of surface roughness and waviness desired or the direction of the surface pattern.

For example, an armament maker placed an order during the war for a part on which an "ultra" finish was specified. The supplier translated this specification to mean a surface of between 1 and 2 micro-inches, and in trying to secure such a fine surface finish fell badly behind on deliveries. In resulting conferences, it developed that by "ultra" finish, the buyer had meant a surface not rougher than 13 micro-inches, which could easily be achieved at a good rate of production.

It was misunderstandings of this sort that prompted the American Society of Mechanical Engineers and the Society of Automotive Engineers, in 1932, to sponsor an investigation into the possibility of standardizing the classification and designation of surface qualities. Some results of the committee's work have now been published as an American Standard (Part I of ASA B46.1-1947, entitled, "Surface Roughness, Waviness, and Lay").

In this standard, the following definitions of the geometrical irregularities of surfaces are given:

Roughness—Relatively finely spaced surface irregularities. On surfaces produced by machining and abrasive operations, the irregularities produced by the cutting action of tool edges and abrasive grains and by the feed of the machine tool are roughness. Roughness may be considered as superimposed on a "wavy" surface.

Waviness—Surface irregularities which are of greater spacing than the roughness. On machined surfaces, such irregularities may result from machine or work deflections, vibrations, etc. Irregularities of similar type may occur due to warping, strains, or other causes.

Flaws—Irregularities which occur at one place or at relatively infrequent intervals in the surface, such as a scratch, ridge, hole, peak, crack, or check.

Lay—The direction of the predominant surface pattern.

The height of the roughness or waviness may be specified in one of these ways: (1) Maximum peak to valley height; (2) average peak to valley height; or (3) average deviation from the mean surface—either root mean square or arithmetical. A note should be included in specifications and on drawings to indicate which method of height rating is used.

Surface specifications may be placed on drawings by a check mark and horizontal extension, as shown in Fig. 1. Here the number 16 indicates the roughness height in micro-inches (millionths of an inch), 0.0005 is the waviness height in inches, and 0.030 indicates the roughness width, also in inches. The lay designation of the surface pattern, when required, is indicated by a symbol placed under the horizontal extension, to the right of the check mark and to the left of the roughness width value. In the example shown, the symbol indicates that the direction of lay is perpendicular to the surface indicated by the symbol. Other symbols indicating direction of lay are as follows:

Symbol	Direction of Lay
=	Parallel to the surface
X	Angular in both directions
M	Multi-directional
C	Approximately circular, relative to the center of the surface
R	Approximately radial, relative to the center of the surface

Specify Surface Quality

Recommended roughness height values, in micro-inches, are: 1/4, 1/2, 1, 2, 3, 4, 5, 6, 8, 10, 13, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 600, 800, and 1000. The following waviness height values, in inches, are suggested: 0.00002, 0.00003, 0.00005, 0.00008, 0.0001, 0.0002, 0.0003, 0.0005, 0.0008, 0.001, 0.002, 0.003, 0.005, 0.008, 0.010, 0.015, and 0.020.

During the sixteen years that the committee has been functioning, individual companies have been spending a lot of time and money on the study of surfaces. War requirements for parts such as shock absorbers and gun recoil mechanisms, which required air- or fluid-tight seals, stimulated the study. Among other parts studied were the fuel injection plungers for Diesel engines. These plungers had to be centerless-lapped to a surface roughness of less than 2 micro-inches while being held to $\pm$ 0.0000035 inch for size and to $\pm$ 0.000005 inch for both roundness and straightness.

During the war, there was little time for running in bearings or adjusting bearing parts that had worn because their surfaces were too rough to start with. Individual companies have accomplished much in determining just how smooth the various surfaces of their products should be. One machine tool builder, for example, has four surface finishes which are specified for all the between-center and centerless type grinding done in the shop. Samples showing these finishes are illustrated in Fig. 2. Sets of these samples are kept in each grinding department for visual and "fingernail" comparison with the finished jobs. Such direct-comparison tests have eliminated more than 50 per cent of inspection complaints.

Each sample bears its roughness value in micro-inches r.m.s. Finishes B, C, and D are usually so specified on drawings, but finer finishes are specified directly in micro-inches and are checked on the Profilometer or some other surface analyzer. The values given for each type of finish are the maximum that may be classed as coming within the range of that particular finish.

Grind finish D (a surface finish of 40 micro-inches r.m.s.) is used for parts that are ground to provide an accurate locating surface for a finish-grinding operation. A stem gear that is held in a collet for cutting the teeth is an example. This finish is also used for maintaining close tolerances on the sides of parts that will be press-fitted at assembly, such as bushings.

Grind finish C (a surface finish of 25 micro-inches) is specified whenever medium-fine finishes are required. Examples include parts where an ordinary sliding or running fit is required on shafts having rotational speeds of 100 to 200 surface feet per minute, such as sliding clutches and gears. This finish is also used when grinding for anti-friction bearing fits and for the appearance of parts mounted on the exterior of machines, such as handles, where exact size is secondary. Approximately 75 per cent of the grinding performed in this plant is within the C surface finish range.

Grind finish B (a surface finish of 10 micro-inches) is used where a fine finish is required, as, for instance, on certain machine arbors and arbor collars. It is also employed on shaft journals rotating at from 200 to 300 surface feet per minute. The ultra-fine surface finish A (5 micro-inches) is used where an exceptionally fine finish is required, as on rolls for producing steel and brass strip stock. This finish is also specified for shaft journals rotating at from 300 to 400 surface feet per minute.

In addition, a mirror finish is applied to rolls for making aluminum and gold foil. A finish of 1 1/2 micro-inches is used for finishing the bearing journals on shafts that rotate at more than 400 surface feet per minute. These values have been in use for about a year and are subject to change when experience shows it to be desirable. So far they have proved satisfactory. All four standard finishes are the result of one or more grinding operations, and no surfaces are lapped.

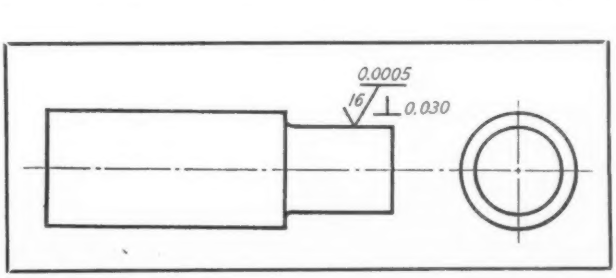


Fig. 1. Recommended Method of Indicating Surface Specifications on Drawings. The Checked Surface is to have a Maximum Roughness Height of 16 Micro-inches, a Waviness Height of 0.0005 Inch, and a Roughness Width of 0.030 Inch

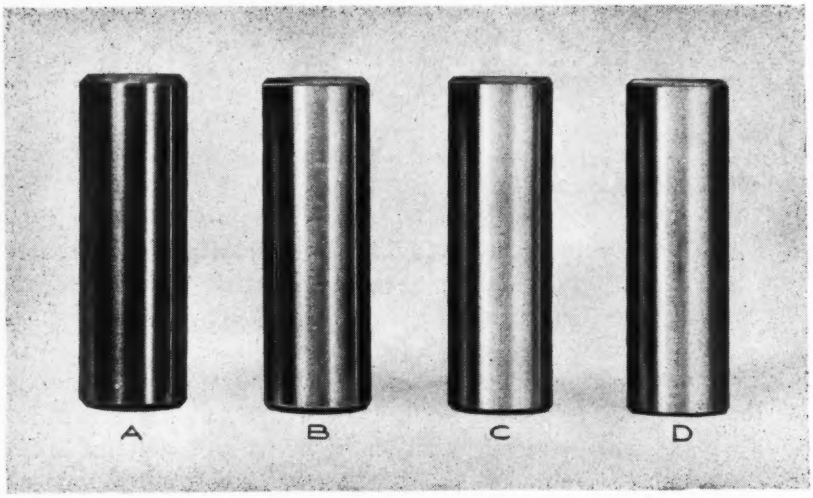


Fig. 2. Surface Finish Samples Employed by a Machine Tool Manufacturer for All Grinding Operations. Sets of Samples are Kept in Each Department for Visual and "Fingernail" Comparison with the Finished Part

Another machine tool builder uses sample rolls having surface finishes of 1, 2, 4, 6, and 8 micro-inches for comparing the finish secured. Typical values used by this company are 6 to 8 micro-inches for wheel-spindles and live spindles for headstocks; and 4 to 6 micro-inches for master cam spindles.

Following is a list of the surface qualities specified by a number of shops for a variety of products. For some parts, the values given are the tolerances allowed, while for other parts, the maximum and minimum are those specified by different shops.

Product	Roughness Height, Micro-Inches r.m.s.
Armature shafts	2 to 3
Camshafts	4 to 6
Cold mill rolls	4 to 7
Crankpins	3 to 4
High-finish strip rolls	1/2 to 1
Hot mill rolls, continuous	10 to 15
Plug gages	0.4 to 0.7
Railroad car journals	2 to 7
Roll journals	1 to 2
Pistons	2 to 4
Cylinder bores	3 to 7
Piston-pins	1
Valve stems	3
Tappet faces	2
Tappet barrels	3
Back-up rolls	10 to 20

There are several ways of securing a comparison between surfaces. Some companies make samples, like those shown in Fig. 2, of the surfaces that are specified by the design department. These samples are supplied to the designers, production men, and inspectors for comparison. Other shops take samples having the desired surface qualities out of the production line. Others use sets of sample surfaces made commercially by several suppliers. The conditions existing in the particular shop determine which method is preferable.

Rated surface specimens of some sort are invaluable in the designing and drafting departments to give the designer an idea of the surface quality produced by the various machining operations. As a means of shop control, there is a considerable difference of opinion about the effectiveness of the eye and fingernail methods of comparing specimens with actual production samples. However, a large number of shops use these methods. When each sample is marked with the exact roughness measure, the surface finish can be accurately specified.

Some shops claim that when the surfaces being compared are of the same material as the sample and finished by the same machining method, comparison by the visual method and touch is adequate. Others claim that this method has not proved entirely satisfactory in the shop. The human element involved is great, and differences in such factors as sizes, curvature, material, state of oxidation, and the like can lead to large discrepancies in making the comparison. Many companies, especially those dealing with fine surfaces and requiring close adherence to standards, measure all surfaces with the Profilometer (Fig. 3) or the Brush surface analyzer.

Companies that have given careful study to surface quality have discovered many things of practical dollars and cents value. For example, they have ascertained what operations are necessary to obtain a surface having a certain quality, and what those operations cost. One company found that, in its own shop, the relative cost of various surfaces made in the usual ways was:

1. Hardened and ground, lapped, or polished 100
2. Ground or turned, and lapped or honed to eliminate tool marks........... 90
3. Fine grinding 50
4. Finish grinding 40
5. Medium grinding 20
6. Rough grinding ....5 - 10

If a dozen shops that have not made thorough studies of surface quality were given the same fine surface to reproduce, the chances are that each shop would have its own sequence of operations. Often, some of the operations may add nothing to the final result. It is even possible that certain of the operations may roughen the surface instead of improving it. Shops that have actually measured the surface produced right at the machine have speeded up work and reduced costs by eliminating useless operations. This is often true of the final polishing operation, which is usually performed only for the sake of appearance.

One shop that strove for a very fine finish surface by means of a sequence of operations had trouble in getting the correct final dimension. Checking back, it was found that the dimensions were correct to very close tolerances when the part left the next to last operation. Some of the dimensions changed in the last operation. Further study showed that, although the dimensions were correct after the next to last operation, there was a comparatively wide difference in surface quality. The reason was that the rougher parts had deeper hills and valleys than the smoother parts. Consequently, the rougher parts have less material to be removed and are worn under-size by the final operation. The trouble was overcome by employing surface quality control in the earlier operations to maintain uniform roughness. Then a given amount of application of the final operation produced the same amount of wear, with consequent greater dimensional uniformity.

When the designing department tries to control the surface by specifying the operations to be performed, it has often been found that identical set-ups on different machines will produce surfaces varying as much as 400 per cent in roughness. As a rule, visual comparisons with standard surfaces will not accurately indicate this because the lay of the grind, its reflectivity, and various other factors can cause surfaces widely different in roughness to appear the same. On the other hand, two surfaces of the same roughness may appear very different when inspected visually.

Great improvements in production have resulted from improving the quality of the cutting edges on tools to give better surface quality. This is especially true of carbide cutting tools. The smoothness of the cutting edge cannot be measured directly, but the smoothness of the intersecting tool surfaces can. The smoothness can be improved by grinding, lapping, or stoning the tool to a surface roughness of a few micro-inches. This often reduces the sharpening time required, since the tool life between grinds is generally lengthened. In some instances, the improved surface quality so produced eliminates subsequent operations, or at least reduces them.

Dimensional errors and some surface defects are often due to the faulty cutting action of dull cutting tools or wheels. If allowed to continue, the result may be a large quantity of spoiled work. When tools or wheels begin to become dull, a signal is given by an increase in the range of surface roughness produced. Frequent checking of surface quality during production will catch the condition at the start and prevent dimensional errors.

Such checks of surface quality at the start of a new set-up and after tool sharpening or wheel dressing will often show roughness which can be eliminated by slight adjustments of feed, speed, or coolant flow. It is thus apparent that the study of surface quality by machine shops is of value, not alone in order to specify the proper quality for a given purpose, but also to show how to secure such qualities economically.

Fig. 3. By Means of a Profilometer, Average Surface Roughness of Part being Measured can be Read Directly

Engineering News

Both Gold and Chromium Plated on Die-Castings

Gold and chromium are both plated on a single piece of die-cast metal by a process developed by the Continental Die Casting Corporation, Detroit, Mich., a division of the F. L. Jacobs Co. In this process, the casting is first given a copper plating for hardening and is then nickel-plated to provide resistance to corrosion. Masking material consisting of copper nickel covered by a plastic coating is next placed over the area to be gold-plated, and then the casting is chromium-plated. After the chromium-plating, the mask is removed and the casting goes to the gold-plating bath. Finally, the gold-plated area is sprayed with enamel and baked for an hour to provide a protective coating for the gold.

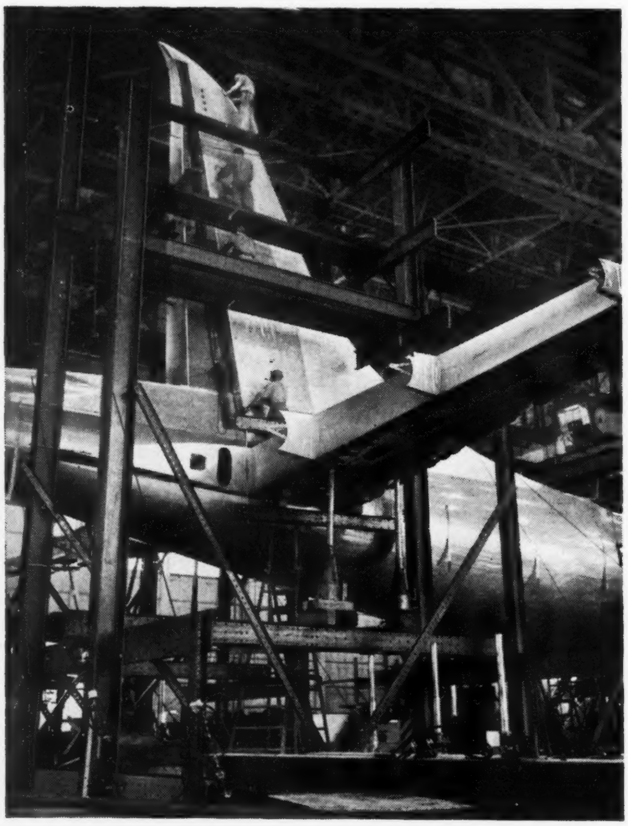
New Alloy of Nickel and Iron for Electronic Amplifiers

A revolutionary development of especial interest to the electrical industry because it makes possible the doing away with vacuum tubes in amplifiers and also effects far-reaching changes in rectifiers has been announced by the Naval Ordnance Laboratory, White Oak, Md. This development consists of the production, for the first time in the United States, of an alloy of nickel and iron which becomes highly magnetized the instant it is placed in an electrical field.

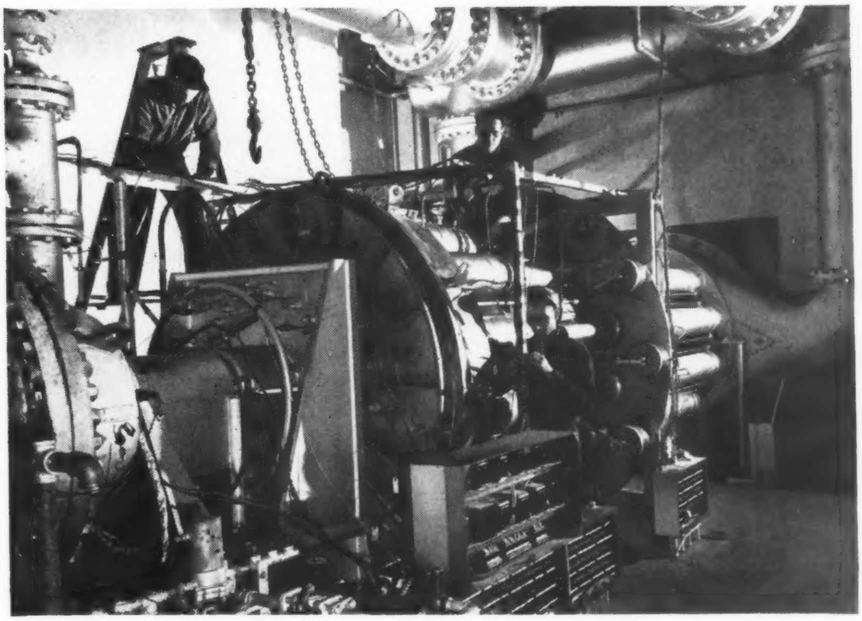
Under the name "Permenorm," this alloy was first synthesized by the Germans in 1943 and remained a closely guarded secret. Duplication of the alloy was finally accomplished by two scientists of the Naval Ordnance Laboratory. The most important application of the alloy will be in electronic amplifiers used in guided missiles and fire-control equipment.

Application of Powdered-Metal Parts in Automobiles

Many small sintered metal-powder parts are being used in the 1949 Ford, Mercury, and Lincoln automobiles, according to a recent announcement. These parts include bushings and pistons in the shock absorbers; steering assem-



Two Shifts of Engineers and Technicians are Working Six Days a Week to Destroy This B-36 Super Bomber, the First off the Production Line at Consolidated Aircraft's Fort Worth, Tex., Plant on a New U. S. Air Force Contract. The Airplane is being Scientifically Broken up at the Wright-Patterson Air Force Base in Ohio to Test the Strength of Its Wings, Fuselage, Tail Surfaces, and Other Parts. Weaknesses are Carefully Observed and Reported to the Manufacturer for Correction. This Standard Procedure for All New Production Airplanes was Ordered by the U. S. Air Force in Order to Uncover Defects that, in Flight, might Cause Fatal Accidents



Turbine Test Stand in the New Jet-engine Laboratory of the General Electric Co., Lynn, Mass. With This Equipment, Turbines can be Tested under Simulated Operating Conditions at Horsepower Ratings up to 30,000. The Equipment is not a Jet Engine, although It Looks Like One

bly bushings; generator and starter bearings and bushings; distributor bushings; bushings and clips in the windshield wiper assembly; clutch cross-shaft bearing and pilot shaft bearing; pump bushings; and bushings in the electric blower motors of the air-conditioning system.

Because of the wide range of materials that can be utilized in powder metallurgy and the physical properties obtained by the manufacturing process, replacement of numerous parts in the engine and chassis with powdered-metal parts is being considered. Gears, cams, electric motor parts, and even some structural parts may be produced by this method in the future, according to officials of the Ford Motor Co.

Rubber Insulation that Improves in Water

Electrical wire covered with a rubber insulation that improves when soaked in water has been developed by the United States Rubber Co. for use in wiring homes, factories, offices, and other buildings. This wire was especially designed for use underground and in wet locations, where high moisture resistance gives it longer life and increased safety. It is particularly suitable for underground lead-ins and the wiring of damp basements. Durability has been obtained by providing a coating of high-purity natural rubber latex, which is applied by the dip process.

In tests conducted by Underwriters' Laboratories, Inc., the wire was immersed in water at a temperature of 122 degrees F. for twenty-four weeks. These tests showed an insulation resistance rise from 500 megohms to 2400 megohms per 1000 feet of wire. The resistance curve of ordinary insulation shows a sharp drop after an immersion of from two to four weeks.

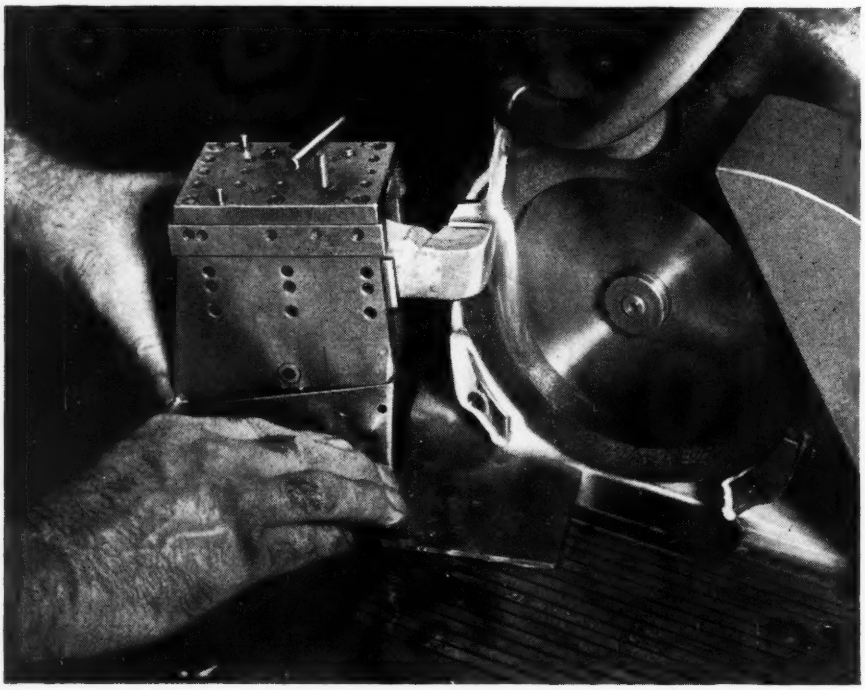
Precision Camera for Testing Photographic Lenses

A camera for testing the qualities of lenses made to new formulas has been developed by the Research and Engineering Division of the Bausch & Lomb Optical Co., Rochester, N. Y. This camera is intended for testing all types of photographic lenses, ranging from those provided in a home moving-picture camera to telephoto lenses of 8-inch focal length. It maintains parallelism between the film plane and the lens board within 0.0005 inch, which is about one-sixth the thickness of a sheet of ordinary writing paper. A micrometer device provides control of focussing to the same degree of accuracy. Negatives of photographs taken with the camera can be quickly compared with test charts to measure resolving power, curvature of field, astigmatism, and distortion.

Equipment for Testing Reaction of Pilots to Supersonic Speeds

To test the reaction of pilots to supersonic speeds, the Navy is building a large centrifuge that will whip volunteer airmen around a single pivot point at speeds comparable to those encountered in jet aircraft. Instruments will test vision, hearing, and balance, and an electroencephalograph will record brain waves and check consciousness.

Sharpening Carbide Tools



Relative Merits of Wet and Dry Grinding; Coolants, Speeds, and Feeds Used; and Recommended Methods for Sharpening Single-Point Carbide Tools and Grinding Chip-Breakers—Second of Three Articles

By CHARLES H. WICK

TYPES of grinding machines available and selection of abrasive wheels for sharpening carbide tools were discussed in the first installment of this article, published in July MACHINERY, page 145. In the present article, the advantages and disadvantages of both wet and dry grinding are dealt with, and recommended methods for sharpening single-point carbide tools and grinding chip-breakers are described.

When to Use Wet or Dry Grinding

The advantages of using a coolant when sharpening carbide tools are:

1. It helps to keep the grinding wheel clean and sharp, thus reducing the need for frequent dressing and prolonging wheel life.
2. Temperature of the carbide and the steel shank is kept at a minimum during the grinding operation, permitting handling and inspection.
3. Finer finishes are produced on the carbide than with dry grinding, using the same grit-size wheel.
4. Wheels having bonds one or more grades harder than those used for dry grinding are permissible, with resulting reduction in the rate of wheel wear. (However, if the coolant is too heavy-bodied or oily, a softer grade of wheel is required.)
5. Since abrasive, bond, and carbide dust are carried away by the coolant, there is no need for an exhaust system.
6. Grinding speeds may be increased over those used for dry grinding.

However, satisfactory results are obtainable by either wet or dry grinding, provided the grinding operation is performed properly. In fact, most of the companies covered in the survey stated that carbide tools sharpened on silicon-carbide wheels in their shops were ground dry. The reasons for this are better visibility of the grinding operation, operator preference (since he avoids getting wet), and the fact that most equipment is not satisfactory for wet grinding. Also, most of these manufacturers have found that this method actually produces less cracked carbide tools, probably because, in wet grinding, it is practically impossible to obtain a steady, sufficient flow of coolant to keep the entire face of the wheel and tool covered at all times.

Intermittent localized heating and a quenching action frequently occur in improper wet grinding, resulting in cracking of the carbide. Another advantage of dry grinding is that loose abrasive is thrown off the wheel as it sharpens itself, whereas the loose abrasive sometimes tends to cling to the wheel in wet grinding, often causing a battering instead of a cutting action.

More frequent dressing, lower pressure of tool against wheel, and occasional air-cooling periods

are necessary when grinding carbide tools dry. During the grinding operation, the tool should be kept in motion continuously, and large areas of contact between wheel and work should be avoided to minimize the danger of overheating. Warm carbide should never be dipped into any liquid. However, the steel shank of tipped tools can be quenched if air cooling is too slow.

An exhaust system of sufficient capacity to remove all the wheel breakdown is a definite advantage in dry-grinding carbide tools.

Wet grinding is recommended when using diamond wheels for sharpening delicate or precision tools. A resinoid-bonded diamond wheel will char at temperatures above 600 degrees F., making the use of a coolant mandatory. A metal-bonded diamond wheel may be used dry with little effect on the bond or wheel life. However, wheel manufacturers recommend the use of a coolant even with this type of diamond wheel to keep the work cool and the cutting face of the wheel clean.

A continuous and plentiful supply of coolant, making contact with the wheel just above the tool and covering the working faces of both wheel and tool, should be used for the wet grinding of carbides with silicon-carbide wheels. A generous volume of coolant is directed on both the grinding wheel and the carbide-tipped single-point tool seen being ground on a Norton Bura-Way grinder in the heading illustration. "Damp grinding," consisting of insufficient or an intermittent flow of coolant, is more objectionable than dry grinding with this type of wheel because it causes strains or cracks due to intermittent heating and cooling.

The amount of coolant used with diamond wheels may vary from a small stream to a mere "wetting" applied to the wheel face by a felt pad. The rate of coolant flow should be fixed, whenever possible, to prevent the operator from reducing the flow to avoid splashing. A tool quickly removed from contact with the wheel during grinding should not be too warm to touch.

Coolants Recommended for Carbide Grinding

A thin solution of soluble oil, containing eighty parts of water to one part soluble oil, is preferred by most plants for sharpening carbide tools. Plain water is a satisfactory coolant, except for its rusting action on the ways and other precision parts of the grinding machine. About 10 per cent of sal soda or some other chemical may be added to the water to make an alkaline solution that will minimize rusting.

Kerosene is also used in some plants to keep diamond wheels clean and sharp, although it is not considered as effective a coolant as soluble oil. As kerosene presents a fire hazard, it should not be used on metal-bonded diamond wheels. Cimcool, Microgrind, Optogrind, Transo-Soluble, Stanisol, Stadoil, and DTE machine oil are among the other commercial cutting fluids that have been found satisfactory for this purpose.

Since most tool-grinding machines are not designed for wet grinding, many plants have modified them to supply coolant from a small pump or by gravity from a container supported above the grinding wheel. A small tube to carry the coolant to the point of application, means of regulating the rate of flow (such as a petcock or needle valve), a coolant reservoir tank, and guards for the machine ways and bearing surfaces should also be provided. Since such equipment is often impractical for sharpening milling cutters on tool and cutter grinders, a saturated felt pad held in contact with the wheel by means of a flat spring is employed in these cases to moisten the wheel.

Speeds and Feeds Employed

An average wheel speed of 5000 surface feet per minute is recommended for sharpening carbide tools. Slower speeds are only required when grinding carbides containing relatively high percentages of tantalum or titanium, where the

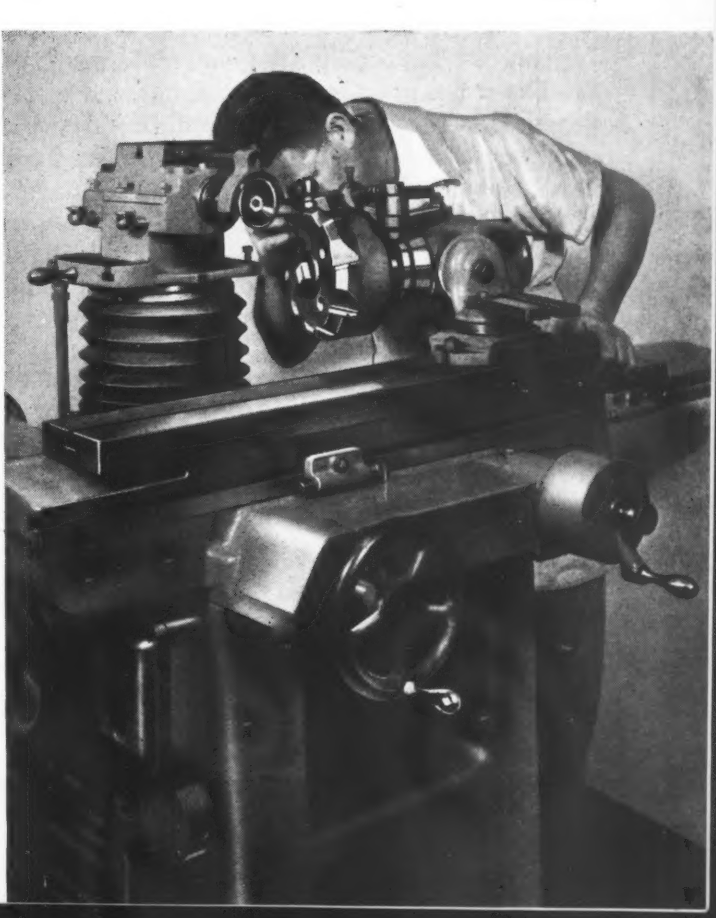


Fig. 1. A Magnifying Glass Should be Used to Make Sure that All Cracks or Abrasion Marks are Removed from the Carbide

Table 1. Average Traverse of Grinding Wheel, Inches per Minute*

Type of Wheel	Type of Grinding Operation		
	Roughing	Semi-Finishing	Finishing
Silicon-Carbide	100	30	15
Diamond	...	10	5

*Depends on area of carbide presented to wheel, and rate of breakdown of wheel.

Table 2. Maximum Feed of Carbide Tools into Grinding Wheel, Inches per Pass*

Type of Wheel	Type of Grinding Operation		
	Roughing	Semi-Finishing	Finishing
Silicon-Carbide	0.003	0.001	0.0005
Diamond	.....	0.0005	0.0002

*Depends on area of carbide presented to wheel, and rate of breakdown of wheel.

thermal conductivities of the carbide are less and the tools are more easily damaged by heat generation. Care should be exercised not to exceed the safe speed given on the blotter of the grinding wheel, and an attempt should be made to maintain a uniform surface speed. Metal-bonded wheels can be operated satisfactorily at speeds as low as 3000 surface feet per minute. The use of a variable-speed grinding machine to compensate for diminishing wheel diameter by increasing the wheel speed is economical only when performing a considerable amount of rough peripheral grinding on large-diameter wheels.

Average traverse and maximum cross-feeds for carbide sharpening are given in Tables 1 and 2. The cross- or in-feed used on diamond wheels depends on the grit size of the diamonds. Diamond grains of 100-grit size have a mean diameter of about 0.006 inch. About three-quarters of this diameter must be embedded in the bonding matrix, leaving only 0.0015 inch of cutting edge projecting from the face of the wheel. The in-feed should not exceed one-third of this cutting edge (0.0005 inch) or the bond will be disintegrated by the carbide after the diamond has become worn. With diamond wheels, feeds exceeding those shown will not damage the carbide, but will cause rapid wheel wear. Fast stock removal is nevertheless possible by combining low feed with fast traverse. The wheel should be allowed to spark out on the last few passes to get the best possible finish.

Hand traverse of the tool past the wheel is preferred to automatic traverse, since, with an experienced operator, greater sensitivity is thus possible. A good operator can actually feel whether the wheel is cutting properly. Care must be taken, however, to keep the tool moving across the wheel at all times, in order to avoid overheating, distribute wear on the wheel, and obtain a good finish. The tool should be held on a rest or table adjusted to the required angle.

In off-hand grinding, a light pressure of the tool on the wheel—sufficient to provide efficient grinding but not enough to cause overheating—is desirable. Heavy pressure does not give more rapid stock removal and shortens the wheel life by causing it to break down more rapidly; it may also damage the tool due to overheating.

Usually, the direction of rotation of the grinding wheel should be down on the cutting edge of the tool, so that the wheel grinds from the cutting edge toward the body of the tool to prevent the breaking out of small carbide particles at the cutting edges. However, this is not always convenient, and is unnecessary if proper care is taken. In fact, in grinding multi-tooth cutters, taking light cuts, such as 0.0003 inch per pass, some companies consider that having the wheel rotate off the cutting edge is safer.

Grinding Technique — Peripheral vs. Side Grinding

Grinding of carbide tools on the periphery of the wheel is faster than side grinding, and is preferred by most plants for rough grinding, where rapid removal of stock is important. Also,

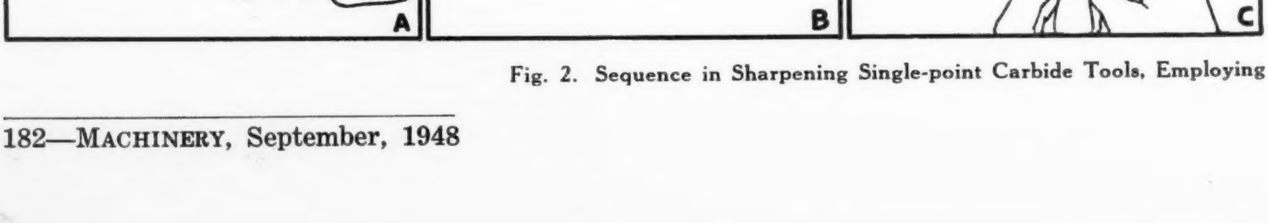


Fig. 2. Sequence in Sharpening Single-point Carbide Tools, Employing

there is less chance of generating heat, and therefore less care is required, with peripheral grinding. Crowning of silicon-carbide wheels to a convex periphery 1/32 inch to 1/16 inch high, reduces the contact area between the wheel and the tool in peripheral grinding, thus promoting rapid wheel breakdown and self-sharpening, as well as minimizing heat generation.

One criticism of peripheral grinding is the under-cutting or hollow grinding of flat surfaces on the tool. This is undesirable because the brittleness of carbide requires maximum support under the cutting edge. However, if the edges of the tool are ground straight in the finishing operation, such hollow grinding can be advantageous, since it reduces the area of contact between the wheel and work. Also, the amount of under-cutting when relatively large-diameter wheels (8 inches in diameter or more) are used is very small. When tools are rough-ground on the periphery of a wheel and finished by side grinding, a 1/32-inch land should be left at the cutting edge of the "flat" surface for finishing. The danger of chipping the carbide is thus minimized by not allowing the wheel to contact the cutting edge during rough grinding.

Side grinding on a cup or dish type wheel, which is generally preferred for finishing operations, has the advantages of more uniform cutting speeds throughout the life of the wheel and more accurate control of tool angles by presenting a flat area of contact to the tool. However, the larger this area of contact, the more danger there is of cracking the carbide due to heat generation. In some cases, silicon-carbide cup-wheels are also crowned by dressing.

Carbide tools should be examined before grinding and at regular intervals during the operation with a magnifying glass (about 10 power) to insure the removal of all cracks, flaws, craters, and abrasion marks. Fine thermal cracks on the flank of the tool perpendicular to the cutting edge, often formed when the tool is used at speeds above 300 feet per minute, are difficult to detect unless magnified.

An operator is shown in Fig. 1 inspecting the carbide tip of a face mill that has been sharpened on a Cincinnati cutter and tool grinder equipped with a flaring cup diamond wheel. Fine cracks can also be detected by sand-blasting or etching of the carbide tip. The use of a templet is an accurate and fast method of inspecting the tool angles ground.

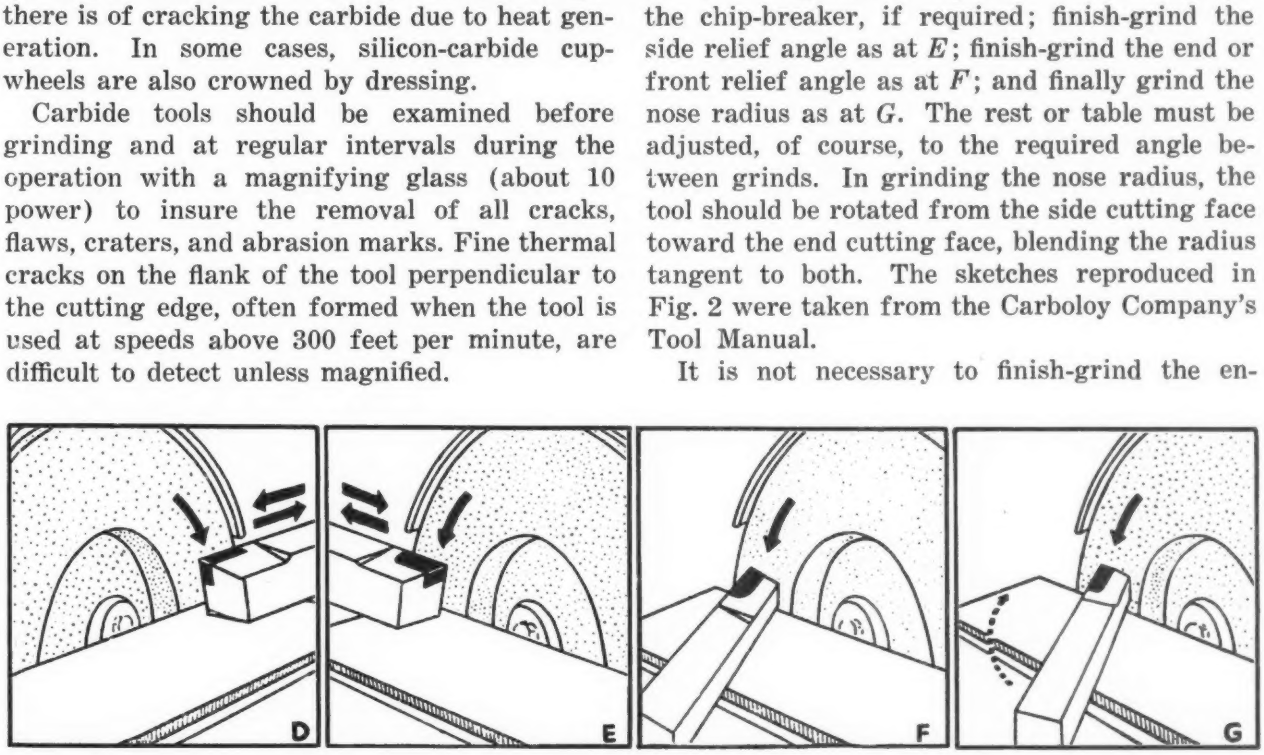
The following general instructions for grinding various classes of carbide tools apply to typical commercial applications. Specific techniques will, of course, vary with the company, operator, and grinding machine used.

Sharpening of Single-Point Tools

Although generally required because of the cratering action of steel on carbide, grinding the top of carbide single-point tools should be avoided wherever possible. When required, it is generally considered preferable to grind the top surface before the other surfaces, in the manner shown at *A* in Fig. 2; this is claimed to minimize the danger of edge flaking and helps to furnish keener cutting edges.

The order in which the other surfaces of the tool are ground varies considerably, usually depending upon personal preference or on the visibility of the tool during grinding. One commonly used procedure is to rough-grind the side relief angle, as shown at *B* in Fig. 2; rough-grind the end clearance or front relief angle as at *C*; finish-grind the top face as at *D* or grind the chip-breaker, if required; finish-grind the side relief angle as at *E*; finish-grind the end or front relief angle as at *F*; and finally grind the nose radius as at *G*. The rest or table must be adjusted, of course, to the required angle between grinds. In grinding the nose radius, the tool should be rotated from the side cutting face toward the end cutting face, blending the radius tangent to both. The sketches reproduced in Fig. 2 were taken from the Carboloy Company's Tool Manual.

It is not necessary to finish-grind the en-



a Straight Wheel for Rough-grinding and a Cup-wheel for Finishing

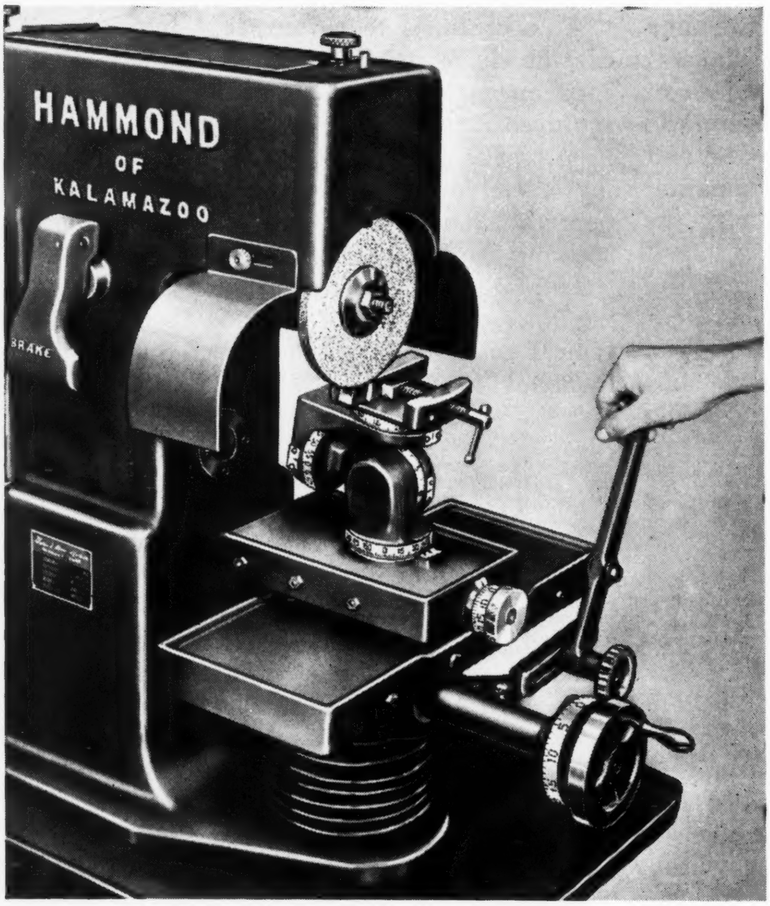


Fig. 3. A Universal Vise Arrangement is Employed on This Carbide-tool Grinder to Produce a Chip-breaker in the Top Face of the Tool

tire faces of the carbide tip. If the primary relief angles extend beyond the cutting edge about 1/16 inch, the finish grinding is considered sufficient.

In this way, the secondary relief angles need only be reground occasionally. When the top surface of the tool is severely nicked, it should be hollow-ground on the periphery of a roughing wheel, leaving a land of from 1/32 to 1/16 inch adjacent to the cutting edge for finish-grinding. The tool should always be kept moving back and forth across the wheel.

Method of Grinding Chip-Breakers

A chip-breaker is a step ground into the top surface of a tool to prevent the formation of continuous chips by stressing the chip and causing it to break off. The depth and width of the chip-breaker varies with the depth of cut, feed, material being cut, and cutting speed. The angular type of chip-breaker, which deflects the chip back against the uncut portion of the work, is the easiest to grind. Parallel and groove type chip-breakers, which are generally about 0.020 inch deep and 1/16 to 3/16 inch wide, are more difficult to grind.

Chip-breakers are ground, when required, before finish-grinding the side and front relief angles. In this way, any nicks developed in the cutting edge by the breaker grinding operation are removed by the subsequent relief angle grinds. It is not necessary to regrind a chip-breaker until its width has been reduced to a point where the chip is not breaking in proper lengths. This usually occurs on about the third sharpening of the tool.

Chip-breakers can be ground offhand, with the periphery of a wheel, but it is preferable to perform the operation on a universal tool and cutter grinder, a small surface grinder equipped with a universal vise, or a special chip-breaker grinder. A universal vise or adjustable holder permits the tool to be held rigidly and yet be swiveled so that its top face is horizontal. The top of the vise can then be swiveled until the side cutting edge of the tool is parallel to the side of the wheel. Finally, the vise can be swiveled to the desired chip-breaker angle. A straight diamond wheel, 4 to 6 inches in diameter and slightly wider than the chip-breaker, of 100 or 150 grit, and with a vitrified or resinoid bond, is generally employed. As previously recommended for diamond wheels, the feed should not exceed 0.0005 inch per pass. The grinding machine table should be traversed slowly—about one stroke per second.

A chip-breaker is seen being ground on a carbide-tipped tool mounted in the universal vise of a Hammond grinder in Fig. 3. The cross-slide of this machine can be fed by means of a calibrated handwheel, while the longitudinal slide can be reciprocated by the adjustable-stroke hand-lever.

The third, and final, installment of this article will be published in a coming number of MACHINERY.

* * *

In 1929, the average price of composite iron and steel melting scrap was $16.30 a gross ton. By 1937, it had risen to $18.03, and by 1947 had reached $36.36. Industry used about 18,000,000 gross tons of purchased scrap in 1947.

Choosing the Correct Metals-Joining Method

By JOSEPH W. KEHOE
Headquarters Manufacturing Division
Westinghouse Electric Corporation, East Pittsburgh, Pa.

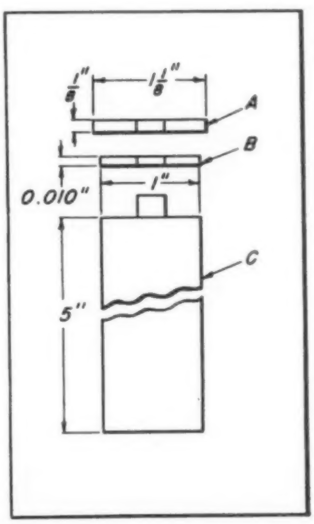
The Factors Involved in Choosing a Metals-Joining Method that will Fulfill Requirements are Presented Here in Chart Form to Aid Manufacturing Engineers and Designers in Making the Correct Selection

WHEN metallic sections are to be joined, one welding or brazing method too frequently is adopted rather than another without proper consideration of the factors involved. This may be due to personal preference or it may be due to a lack of knowledge of the relative values of the major joining methods; inavailability of correct equipment; or accessibility of incorrect equipment already in the user's plant. Whatever the reason, it may result either in a part that is costly to produce or in one that does not come up to specifications—or both.

In an effort to consolidate the experience of people engaged in the field of metals joining, the Headquarters Manufacturing-Engineering Department, the Materials Engineering Department, and the Industrial Electronics Division of the Westinghouse Electric Corporation jointly developed an analysis chart to aid not only the production divisions of the company, but also customers who requested assistance in the solution of their production problems. This chart is used as a guide in selecting the correct metals-joining method from the standpoint of quality and economy. It also serves as a guide in the choice of new equipment, as well as in the proper use of available equipment. The chart is flexible in that different parts of somewhat similar design can be analyzed as a group, thus eliminating separate studies for each. Hence, the proper consideration of the major metals-joining processes is assured.

The chart, reproduced on pages 186 and 187, covers the major ways of joining metals, including electronic brazing, furnace brazing, resistance brazing, resistance welding, arc welding, automatic arc welding, gas welding or brazing, and automatic gas welding or brazing. Each of these methods could be further subdivided; for example, resistance welding could be broken down into butt welding, projection welding, spot welding, percussion welding, seam welding, and series welding; arc welding could be divided into the metallic, inert gas, carbon arc, and atomic hydrogen processes; and gas welding could be classified according to oxygen-acetylene, oxygen-hydrogen, and natural gas and air processes. But space does not permit this in one chart. Needless to say, the general method should be determined, if possible, before starting the analysis. In most cases, this is governed either by the design of the part; the materials being joined; or the number of parts to be produced.

In the column at the left of the chart are listed the factors determining the choice of the equipment; these include physical factors, installation factors, and costs. At the top is given the part, material, anticipated production, drawing reference, customer's name, and names of the engineers making the analysis. The chart here presented has been filled out for the part shown in



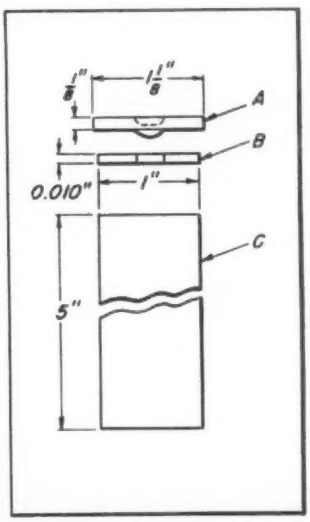


Fig. 1. (Left) Various Joining Methods were Analyzed to Determine the Most Economical and Practical Way of Producing the Contactor Core Illustrated Here

Fig. 2. (Right) The Part was Redesigned as Shown to Take Full Advantage of Resistance Welding, which was Chosen as the Best Joining Method for This Particular Application

File No.: ....

Date: ....

PART NAME: CONTACTOR CORE
PART MATERIAL: S A E NO. 1010 STEEL AND COPPER
ANTICIPATED PRODUCTION: 100,000/YEAR
DRAWING AND ITEM NO.: 12A345. ITEMS A-B-C

	Factors Determining Choice of Equipment	Joining Method		
		Electronic Brazing	Furnace Brazing	Resistance Brazing
Physical Factors	1. Can Material be Joined?	Yes	Yes	Yes
	2. Can Part of This Size and Shape be Joined?	Yes	Yes	Yes
	3. Can Part of This Weight be Handled?	Yes	Yes	Yes
	4. Can Part be Held Within Tolerances?	Yes	Yes	Yes
	5. Will the Joint Stand up in Service?	Yes	Yes	Yes
	6. Will Method Adversely Affect Subsequent Operations?	No	No	Yes
	7. Will Method Adversely Affect Part?	No	No	Yes
	8. Are Any Design Changes Necessary?	No	No	No
	9. Would Redesign Simplify Previous Operations?			
	10. Is Heat-Treatment Necessary?	No	No	No
	11. Can Heat-Treatment be Performed Simultaneously with Joining Operation?			
	12. Will Oxidization Occur on Part?	No	No	Yes
	13. Are Fluxes Required?	Yes	No	Yes
	14. Will Fluxes Affect Part?	Yes	No	Yes
	15. Will Gases Released be Harmful?		No	
	16. Is Brazing Alloy Necessary?	Yes	Yes	
	Is Method Satisfactory?	No	Yes	No
Installation Factors	1. Can Production Rate be Maintained?		Yes	
	2. Is Equipment on Hand?		No	
	3. Is Delivery of Equipment Good?		Fair	
	4. Is Power Supply Adequate?		Yes	
	5. Are Other Utilities Available?		Yes	
	6. Space Required for Equipment		5 by 30 ft.	
	7. Is Space Available for Equipment?		No	
	8. Is Extra Handling Necessary?		Yes	
	9. Skill of Operating Personnel Required		High	
	10. Is Personnel Available?		Yes	
	Is Method Practical?		Yes	
Initial Cost	1. Of Equipment		$15,000	
	2. Of Tooling		$1200	
	3. Of Installation		High	
Operating Cost	4. Depreciation		High	
	5. Maintenance		High	
	6. Utility Cost		Average	
	7. Extra Handling Cost		High	
	8. Labor Cost		High	
	9. Cost of Additional Operations		None	
	10. Estimated Unit Cost		$0.18	
	11. Savings Resulting from Simplification of Previous or Subsequent Operation		$7000	
	12. Anticipated Unit Saving		$0.07	
	Is Method Recommended?	No	No	No

ANALYSIS CHART

CUSTOMER: XY CORPORATION

ELECTRONIC HEATING REPRESENTATIVE..
RESISTANCE WELDING REPRESENTATIVE..
FURNACE BRAZING REPRESENTATIVE...
ARC-GAS WELDING REPRESENTATIVE...

Joining Method					Remarks
Resistance Welding	Arc Welding	Automatic Arc Welding	Gas Welding or Brazing	Automatic Gas Welding or Brazing	
Yes	Yes	Yes	Yes	Yes	
Yes	Yes	No	Yes	No	Part is 1 Inch in Diameter, 5 Inches Long
Yes	Yes	No	Yes	No	Part Weighs 1.25 Pounds
Yes	Yes	No	Yes	No	Part Must Withstand Compression Due to Impact
Yes	No	No	Yes	Yes	
No	Yes	Yes	Yes	Yes	Part Must be Plated
No	Yes	Yes	Yes	Yes	Softens and Warps Items A and C
Yes	No	No	No	No	See Recommended Design for Resistance Welding
Yes					
No	No	No	No	No	
					None Required
No	No	No	No	No	Not a Factor in This Application
No	Yes	Yes	Yes	Yes	
No	Yes	Yes	Yes	Yes	Flux Corrodes the Copper in the Part
None					
No					Silver Solder or Copper
Yes	No	No	No	No	Proof of Quality of Product Required by Laboratory Test
Yes					
No					
Yes					
Yes					
Yes					
5 by 5 ft.					Furnace Brazing Would Require Plant Expansion
Yes					Welder Fits in Assembly Line
No					
Average					
Yes					
Yes					
$5000					
$1000					
Average					
Average					
Average					
Average					
None					
Average					
None					
$0.15					Present Unit Cost, $0.25 for Original Method
$10,000					
$0.10					
Yes	No	No	No	No	

Fig. 1, which is an electrical contactor core constructed of three sections. Sections *A* and *C* are of S A E 1010 steel, while section *B* is a copper disk.

When the adaptability of the various processes was checked, it was found that automatic arc and gas welding would be impractical because of the shape and size of the part. It was also found that, since the part was to be plated, the bead formed by the arc or gas welding process would be undesirable, and that both of these welding methods, as well as resistance brazing, softened and warped parts *A* and *C*. Finally, electronic brazing required the use of a flux, for it is not commercially practical to braze with silver solder (which is the brazing alloy used when brazing steel parts together or a steel part to a copper section) in an induction coil without the use of flux. This restriction does not apply to furnace brazing—in this case—since the copper disk can be used to make the joint; when the joint is made in a controlled-atmosphere furnace, no flux is required. Thus, only furnace brazing and resistance welding were satisfactory from a quality standpoint.

The method finally chosen was determined partly by the factors affecting the installation of the equipment and partly by the cost. For one thing, the space required for a heating furnace would be so large that an addition would have to be added to the plant, while the resistance welding equipment would fit into the production line. Furthermore, as the cost analysis shows, it would cost $0.18 per part if the joint were made in a brazing furnace, whereas by resistance welding, it could be made for $0.15 per part. Thus, resistance welding is the logical choice on the basis of both quality and cost of product.

In order to obtain a product of suitable quality and at the estimated cost, however, it was necessary to redesign two sections (parts *A* and *C*). This step is recommended in the analysis chart under point No. 8 of the physical factors affecting installation. The redesigned part, shown in Fig. 2, is joined in a simple welding fixture. Part *C* (the body of the core) is placed in the fixture. The fixture is located on the bottom electrode arm; it clamps the core body and holds it in the correct position relative to the top electrode. Having the same outside diameter, part *B* (the copper disk) is self-locating with respect to part *A*. Part *A* (the top piece or cap) is then located by an insulated disk that slides concentrically with parts *B* and *C*. This assembly is easier to produce than the original design, a factor that should always be considered in analyzing the various joining methods.

The part produced in this way is of better quality than those made by previous methods. The former method of "hot upsetting" or hot riveting required a subsequent grinding operation. Although a small silver solder ring was used to insure a good joint, much of the joint was later removed by grinding, either to remove the excess metal or to reduce the part to the specified length. Grinding to length does not affect the resistance-welded assembly, since the joint is between instead of on top of the sections as in the former method.

Another important consideration, and one not illustrated by this example, is that of joining and heat-treating the part simultaneously. In one case, a contemplated production part was originally designed to be joined by a method that excluded any use of welding, electronic heating, or furnace brazing; the part was to be sent to an outside agency for heat-treatment. Use of the chart proved the advantages of a method that combined metals joining and heat-treating in one type of equipment—in this particular case, a radio frequency electronic heating unit with a frequency of 450 kilocycles. This kept all joining and treating operations within the customer's plant and under his control.

* * *

Awards to be Given to Developers and Users of Alloy Steels by American Society for Metals

In connection with the "Salute to Alloy Steel" celebration at the thirtieth annual Metal Congress and Exposition, to be held in Philadelphia October 25 to 29, inclusive, the American Society for Metals will present Distinguished Service Awards to individuals who have made outstanding contributions in the development, application, and progress of engineering alloy steels. Individuals are eligible for these awards in all branches of industry, including the machine tool and metal-working fields. The term "engineering alloy steels" is used in contradistinction to tool steels and high-alloy steels.

The Society requests MACHINERY'S readers to submit nominations of men engaged in the design, manufacture, and application of machine tools who would be eligible to receive awards for notable applications of alloy steels in the consuming industries. Such nominations should be sent to J. M. Schlendorf, Chairman, Distinguished Service Awards Committee, care of the Republic Steel Corporation, Republic Bldg., Cleveland 1, Ohio.

Making Micrometer Dials for Machine Tools

By GEORGE BLACK

THE newly designed micrometer adjustment dial now being used on Kearney & Trecker milling machines simplifies small movements of machine units and insures accuracy over an extended period of time. These dials, referred to as rapid-set, positive-lock micrometer dials because they are spring-loaded and accurately serrated, make it unnecessary to adjust a set-screw before resetting. All that is required is to pull out the dial to overcome the resistance of a spring and index to the proper position, as shown in the heading illustration.

In order to prevent wear on the accurately machined serrations provided in the bore of the dials, a steel having a minimum hardness of 35 Rockwell C is required. In addition, to insure long life and accuracy, all surfaces must be stain- and rust-proof. The dials were originally machined from heat-treated carbon steel (S A E 1045) and then chromium-plated. Although the finished product proved satisfactory in the field, manufacturing and plating difficulties made it hard to guarantee uniformity or to maintain fixed production costs.

To overcome these troubles, the dials are now made from "Stainless W," a titanium-bearing, age-hardening, 18-8 stainless steel developed by the Carnegie-Illinois Steel Corporation. The use of this steel eliminates the need for electroplating operations and provides the required rust and stain resistance. Machining operations, including turning, drilling, boring, facing, knurling, and serrating, are all performed while the metal is in the softened condition. Grinding of the large diameter, serrated end face, and tapered surface and cutting of the graduations on the dial are also done prior to hardening.

A specially designed Kearney & Trecker machine, shown in Fig. 1, is used to cut the graduations. The automatic graduating machine consists of a rotary table, which carries the workpiece; a compound slide, which permits feeding the cutter along the angular or straight face of

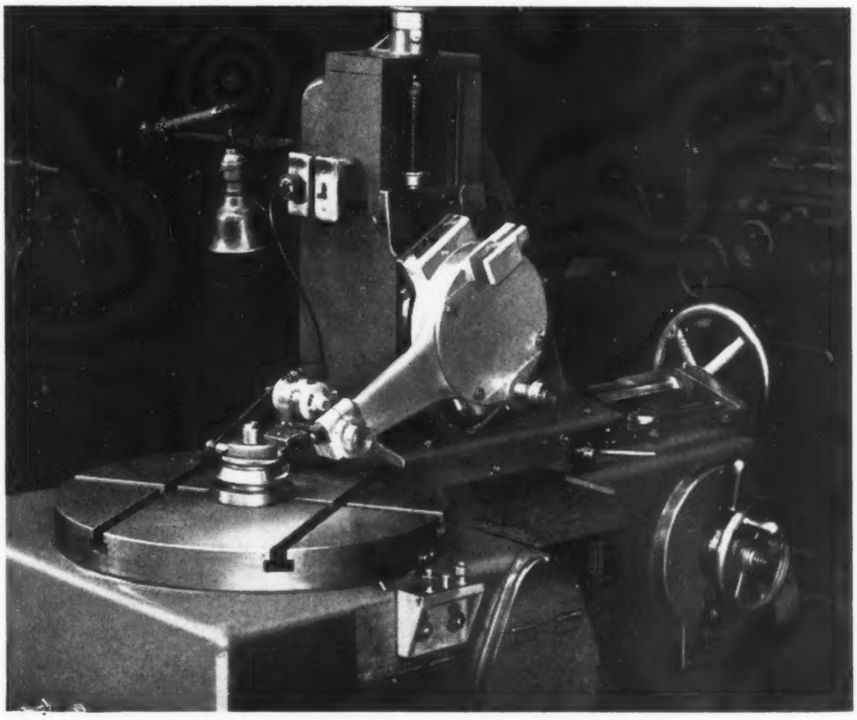


Fig. 1. Graduations are Cut on the Angular Face of Machine Tool Micrometer Dials by Means of a Specially Designed Machine that Automatically Indexes the Work the Proper Amount between Cuts

Fig. 2. Close-up View of Graduating Operation. A Star Cam, Enclosed in the Compound Slide Housing of the Machine Shown in Fig. 1, Controls the Length of the Graduations

the work-piece; and the necessary mechanical elements to connect these two functions into one automatic cycle. Once the machine is set, it will automatically index the proper amount and cut the required length of graduation. An attachment can be mounted on the machine bed that will convert the circular motion of the rotary table into linear feed of the attachment table for graduating scales.

The rotary table, with a No. 50 National Standard taper in the center, is driven by a gear train connected to a worm and worm-wheel. The worm-shaft is rotated by means of a ratchet wheel fastened to the shaft end and actuated by means of a pawl geared to the cutter-feeding mechanism. By adjusting the stroke of the pawl to include one or more teeth, the number of divisions that the rotary table is indexed can be varied. Further variations in indexing are obtainable by the use of ratchet wheels having different numbers of teeth.

A compound slide, adjustable to the full 360 degrees in the vertical plane, determines the direction of the cutter feed. Enclosed in the compound slide housing is a star cam with points of various heights to control the length of the graduated lines. These cams can be changed to suit the required conditions of the work-piece. In this particular case, the ten-degree graduation is longer than the five-degree one, which, in turn, is longer than the single-degree graduation. A close-up view of the graduating operation is seen in Fig. 2.

A small, double-angled, carbide-tipped milling cutter, with an individual motor drive, is employed to cut the graduations. The entire spindle and motor assembly is mounted on the cutter support arm, which is an integral part of the compound slide housing. A horizontal and vertical movement of the compound slide permits the cutter to be adjusted in relation to the work.

After burring, hand-stamping, and complete inspection to check the accuracy, the parts are age-hardened by heating to 950 degrees F., holding at this temperature for a half hour, and then cooling in air. The resultant hardness is well above the minimum required, and is achieved without affecting the close dimensional tolerances specified.

Cleaning and polishing of the dial after age-hardening is followed by vapor-blasting to produce a non-glaring finish. Details of this process were described in an article "Finishing Metals by Liquid Honing," which appeared in March MACHINERY, page 158.

* * *

Kearney & Trecker Corporation Acquires Walker-Turner Co.

The Kearney & Trecker Corporation, Milwaukee, Wis., builder of milling and boring machines, announces the acquisition of the Walker-Turner Co., Inc., Plainfield, N. J., manufacturer of a line of light machine tools for industrial and home workshop uses. The Walker-Turner plant, which will continue to be operated as the Walker-Turner Division of Kearney & Trecker, occupies 180,000 square feet and employs about 400 persons. All facilities will remain in Plainfield, and general supervision will continue under the present management.

* * *

Opportunities for Young Men in the Automotive Field

A booklet outlining the opportunities for young men in the automotive business has been published by General Motors Corporation, Detroit 2, Mich. The book points out the scarcity of well trained young mechanics in the automotive service field, and urges more vocational students to become auto mechanics as basic training for profitable careers. The competent, ambitious mechanic, according to the booklet, can graduate to such positions as shop foreman, parts manager, service manager, jobber salesman, factory service instructor, specialty repair shop owner, or automobile salesman.

Air-Operated Tools in Power Shovel and Crane Assembly Lines

COMPRESSED air is extensively used in the plant of the Thew Shovel Co., Lorain, Ohio, for operating hoists, chipping hammers, drills, grinders, nut-setters, sanders, machine tool air chucks, clamping devices, saws, and other appliances. Over one hundred air-operated tools and devices are in daily use. The air power for this equipment is developed by two reciprocating compressors which produce 1500 cubic feet of compressed air per minute. It is distributed throughout the plant by a pipe system in which the pipe ranges from 6 inches down to 3/4 inch in diameter.

Some of the operations in which air-operated equipment is employed are shown in the accompanying illustrations. Fig. 1, for example, shows a table on which brake bands are assembled. Steel rivets up to 3/4 inch in diameter are driven at tables of this type by using pneumatic yoke riveters suspended by cables. Since all hammer reaction is absorbed by the yoke, operator fatigue is reduced. After the riveting has been completed, a portable grinder equipped with a 1- by 6-inch grinding wheel is used to remove excess stock from the rivet heads. Next, the brake lining is applied, and this lining is drilled and counterbored to receive rivets by employing a pistol-grip drill and a right-angle drill mounted in a yoke, so that the drilling and counterboring for each rivet are done at one setting. Completion of the brake-band assembly is accomplished by employing a light yoke riveting hammer.

Surfaces of welded components are blasted with split steel shot and compressed air to prepare the surfaces for rigid inspection and for spray painting operations. Fig. 2 shows a typical operation being performed in the shot-blast room.

Eyebolts are made in this plant from standard bar-steel stock, 3/16 to 1 inch in diameter, with formed heads ranging from 1/2 inch to 2 inches in diameter. The header used for this work has a stationary bed on which are mounted three sets of half dies for swaging, forming, and finishing the work. An air-operated piston actuates a head that carries the upper halves of the three sets of dies. The heading machine equipped for this operation is illustrated in Fig. 3.

Fig. 1. Pneumatic Yoke Riveter being Employed in Assembling a Clutch Facing to a Brake Band at the Plant of the Thew Shovel Co.

Fig. 2. Shot-blasting an All-welded Shovel Boom prior to Painting. Compressed Air is also Used in the Spray Painting Operation

Fig. 3. Machine Used for Producing the Head on Eyebolts, which is Equipped with an Air-operated Ram for Actuating Upper Halves of Dies

Fig. 4. Tightening Bolts on a Truck Bed by the Use of a Pneumatic Nut-setter which Consumes Less than 10 Cubic Feet of Air per Minute

In operation, a steel rod heated to 1900 degrees F. on one end is placed in the swaging die, after which a forward push on the operating lever brings the head down to close the halves of the die. A further push on the lever causes a ram to reciprocate and form a ball head on the hot steel. The piece is then flattened and worked through the forming and finishing dies. A backward pull on the operating lever causes a stream of air to be exhausted across the dies to blow away scale.

The use of a pneumatic nut-setter for tightening bolts on a truck bed is shown in Fig. 4. This light tool, which consumes, on an average, less than 10 cubic feet of air per minute, can be set for any desired degree of tightness by means of adjustable clutches, which provide an accurate control of the operation. The application of compressed air in this plant has resulted in important economies in production costs and has also raised production levels.

* * *

Shipments of steel pipe and tubes totaled 3,302,748 tons during the first six months of 1948. This represented an increase of 10.7 per cent over the record shipments of the first half of 1947, according to the American Iron and Steel Institute.

Revised American Standards for Taps and Spindle Noses

A revised American standard for taps with cut and ground threads (B5.4-1948) has recently been approved by the American Standards Association, and the Association has also approved a revised standard for spindle noses (B5.9-1948) for tool-room lathes, engine lathes, turret lathes, and automatic lathes. Sponsor organizations for the development of these standards were as follows: The American Society of Mechanical Engineers, the Society of Automotive Engineers, the National Machine Tool Builders' Association, and the Metal Cutting Tool Institute. Copies of the standards are published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18.

* * *

Aeronautics Engineering Courses

The University of Southern California, Santa Maria, Calif., has established a College of Aeronautics which provides courses in aeronautical engineering, airplane and engine mechanics, and air transportation. A bulletin containing details on the curricula can be obtained from the university.

The Machine Tool Industry Studies Selling Techniques

TWO weeks of intensive effort were directed toward analyzing selling problems in the machine tool industry by the "students" who took the sales refresher course held at Cornell University, Ithaca, N. Y., from July 12 to 23, inclusive. This course, which was sponsored by the National Machine Tool Builders' Association and the American Machine Tool Distributors Association, was unique in that the students consisted of company presidents, sales managers, and sales engineers, all interested in better methods of selling and of rendering service to customers. The lecturers were important men in the machine tool building and distributing companies, users of machine tools, and Cornell faculty members.

The thirty or more papers presented dealt with all phases of the selling question. On the first day, James C. Hebert, sales manager of Jones & Lamson Machine Co., pointed out the four fundamentals involved in the sale of machine tools. These are: The origination of an inquiry; the selection of the proper equipment to be quoted; the presentation; and the economic analysis of the purchase of machine tools. Each of these fundamentals was covered in detail.

In his paper "How the Machine Tool Salesman Looks to the Buyer," W. A. Sredenschek, assistant to the vice-president, purchasing and traffic departments, General Electric Co., called attention to the fact that the machine tool salesman today is the key to a large number of problems that have fallen on the buyers' shoulders during the last decade. He mentioned the shortcomings that salesmen must guard against in order to make a continued good impression upon buyers.

"Personal Qualifications for Builders' Salesmen" was the subject of a paper by C. M. Clark, assistant to the sales manager of Cincinnati Milling & Grinding Machines, Inc. This paper discussed, first, character qualifications; second, knowledge qualifications; and third, action qualifications. Under the first category came integrity and the ability to get along with people. Under the second classification were knowledge of the customer's problem, of the salesman's product, and of the competitor's product; and under the third heading were included hard work, perseverance, orderliness and accuracy on details, enthusiasm, and showmanship.

Bernard Lester, in his paper "Origination of the Inquiry—Market Research," pointed out that business enterprises do not progress today without a study of their markets and discussed the benefits of market study and ways of using the information gained from such studies.

In his paper "What Does the Buyer Want?" W. J. Peets, chief engineer of the Singer Mfg. Co., stated that the machine tool sales engineer has a double responsibility. First, he must represent his company in dealing with the buyer, and second, he must represent the buyer in dealing with his company. It is only when he does both of these in adequate fashion that the best results are obtained for all concerned.

Robert L. Giebel, president of R. L. Giebel, Inc., stressed the fact that when a salesman enters the office of a prospect he should possess all possible facts about the product he wants to sell and about the company on which he is calling. One of the first things that a salesman must do is to obtain the customer's attention and hold his interest. That can be done only if the salesman knows what the customer makes, how he makes it, what the company's short- and long-range plans are, and—perhaps most important—something about the personality of the men who do the final selecting of new equipment.

Herbert L. Tigges, executive vice-president and sales manager of Baker Brothers, Inc., submitted a questionnaire pertaining to machine tool selling which had been mailed to buyers of machine tools in various industries. Many constructive comments resulted from this survey and were listed by Mr. Tigges.

"What Information Should the Sales Engineer Give the Customer?" was discussed by Harold G. Warner, assistant master mechanic of the Cadillac Motor Car Division of the General Motors Corporation. Mr. Warner dealt with the following factors affecting the selection of new machine tool equipment: Reputation of builder; presentation of information to sales engineer; quotations; maintenance of accuracy; reliability; production rate; previous service from similar equipment; and cost. One of the points stressed was that the buyer appreciates willingness on the part of the machine tool builder to accede to the customer's wish with regard to design. The

sales engineer should be able to suggest features and devices that will improve the equipment requested by a customer. Mr. Warner pointed out that the sales engineer is expected to be up to date regarding latest manufacturing processes and the equipment built by competitors.

A paper entitled "Practical Illustration of a Typical Situation Employing General-Purpose Machine Tools for Crankcase Production Work" was presented by E. K. Morgan, vice-president in charge of sales for the Giddings & Lewis Machine Tool Co. This paper contained many practical suggestions as to the primary steps to be followed by the sales engineer in determining correct production methods for an unsolved machining problem. The paper analyzed in considerable detail all the steps that would be required in machining a typical automotive crankcase.

"The Effect of Quantity on Machine Selection" was the subject of a lecture by J. R. Weaver, works manager of the East Springfield Works of the Westinghouse Electric Corporation. It was pointed out that basically there are only three types of requirements which create the need for a new machine tool: Replacement of obsolete equipment; development of new products, expansion of existing production facilities, or both; and cost reduction. Mr. Weaver explained that the buyer of machine tools must be a coordinator of technicians, he must have a working knowledge of all the specialized functions that fit together to make up the present-day manufacturing plan. He emphasized that mass production is profitable only because of the existence of mass markets. These markets can only be obtained and expanded by reducing costs. The most important consideration in buying new equipment is not the price of the machine, but the price at which the new machine will produce the product.

In his lecture "Selecting the Equipment to be Offered," E. Payson Blanchard, director of sales for the Bullard Co., made the point that the selection of equipment is the key decision between the salesman and the customer. It calls forth all the engineering knowledge required in selling machine tools, but, more important, it turns the spotlight on the subject of capital investment, manufacturing cost, and profit. Such selling requires a knowledge and understanding beyond the technical requirements of the job. It leads into questions of business administration and the economics of manufacture.

In his paper "The Written Word," C. Denson Day, sales manager of the Norton Co., Grinding Machine Division, emphasized the fact that a written proposal is a silent salesman. In the absence of a sales engineer, with his personality, powers of persuasion, and ability to answer questions, the written proposal must carry on the work of the salesman and complete the job of getting the order. Every proposal should be constructed according to plan, there being three to four basic elements in each proposal, namely, the quotation, itself, which specifies the machine, equipment prices, and terms; the catalogue or specification sheet which describes and illustrates the equipment; the covering letter; and the jacket or proposal cover. All these elements should be carefully reviewed on the basis of the impression that they will make on the customer.

Swan E. Bergstrom, vice-president of Cincinnati Milling & Grinding Machines, Inc., in his paper "Sales Strategy," enumerated fourteen reasons why orders for machine tools are lost, and presented a comprehensive plan of sales strategy that should be of practical value to sales engineers in their efforts to sell machine tools. Briefly mentioned, the principles are as follows: (1) Don't try to do all the talking yourself; (2) don't interrupt your customer; (3) avoid an argumentative attitude that is belligerently positive; (4) in the first half of your interview with your customer, inquire rather than attack; (5) when your customer makes a statement, restate clearly in your own words the gist of each statement that your customer advanced so that he will know that you understand what he is saying; and (6) identify your main sales argument with one key issue; stick to that issue and do not digress.

B. N. Brockman, vice-president and sales manager of the R. K. LeBlond Machine Tool Co., stressed the point that the sales engineer requires more than personality and a thorough understanding of his machines. He also needs photographs or models of the equipment, as well as catalogues, circulars, booklets, reprints, etc. He must be backed up by advertising, direct mail literature, testimonial letters, and sometimes slides or motion pictures. Mr. Brockman pointed out that advertising performs the preliminary steps in the development of an order. It permits a sales engineer to concentrate his limited time on the job that he alone, can do best, namely, closing the sale. Well used, it accomplishes the first three of five steps in the development of an order—contact, interest, and preference. The speaker mentioned that advertising is a "man" who can make hundreds of calls simultaneously and who can contact hundreds of prospects quickly, cheaply, and at regular intervals, but advertising is not a useful instrument unless it

is the right kind—advertisements should be sales talks in print.

In his paper "The Responsibility of the Machine Tool Distributor to the Machine Tool Builder," L. W. Scott Alter, president and general manager of the American Tool Works Co., stated that teamwork between factory representatives and the distributor salesman is of utmost importance. Distributor salesmen should be given every opportunity to perfect their understanding of the machines they are selling through sales meetings in the distributor's headquarters, visits to the builders' plants, and actual selling alongside factory engineers and officials. Another important point is that salesmen should check up on all new installations to show that they have a proper interest in the user's satisfaction with his purchase. Serious complaints should be investigated by the salesman, so that he can explain the defect involved to the manufacturer.

The subject "How to Sell to the Government" was discussed by E. C. Adams, vice-president of the Van Norman Co., who pointed out the reasons why selling to a government department is different from selling to an industrial concern, and gave suggestions concerning the procedure to be followed in trying to obtain government orders.

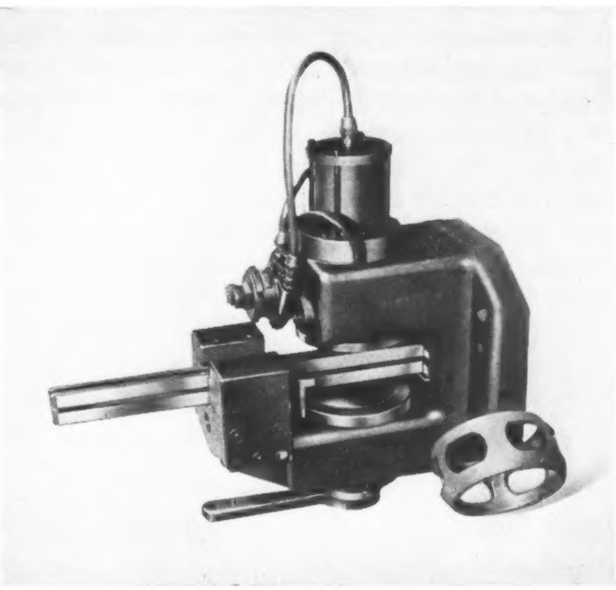
In his paper "Analyzing Failure," Jerome A. Raterman, president of the Monarch Machine Tool Co., stated that the common reasons for losing orders were due to (1) the product; (2) marketing conditions; (3) administration of sales; and (4) the salesman. Mr. Raterman pointed out that buyers are not infallible in selecting machine tool equipment and that the salesman is treading on dangerous ground when he does not try to help the buyer select the best type of equipment required for the job. He emphasized that it is better to lose an order than to sell a piece of equipment that is unsuitable for the job.

* * *

We point out how proud we are of our sales engineer, because of the way he represents both the strength and spirit of our company—in the competence of the information he possesses, in the accuracy of the recommendations he makes, and then (beyond all usual commercial considerations) in the genuine, warm, continuing interest he takes in the customer's welfare in connection with a transaction.—*L. R. Boulware, Vice-President, Employe Relations, General Electric Co.*

Ingenious Fixture Used in Broaching Windows in Bearing Cages

Six windows or openings are broached in ball-bearing retainer cages of the type seen at the lower right of the illustration in one set-up of the work by the use of the fixture shown. Before the cages come to the broaching machine, square holes have been rough-machined at the required spacings around the part. The work is located accurately in the fixture by means of a square flush-pin gage which is seen in the same position as that occupied by the broach during an operation performed on a horizontal broaching machine. After the work has been located, it is clamped hydraulically. The flush-pin gage is then removed to permit application of the broach.



Ingenious Fixture Designed for Broaching Six Openings in Retainer Cages for Ball Bearings

Two diametrically opposite windows are finished at each pass of the broach. Between passes, the work is indexed manually by operating the lever at the bottom of the fixture. Parts of various heights and diameters can be accommodated by the use of quick-change locating plates and guide keys. In operation, the broach is guided by keys in the fixture which engage grooves in the broach.

The alignment and width of the windows or openings must be held to a tolerance of 0.001 inch. Both the fixture and the broach used for this operation were produced by the National Broach & Machine Co., Detroit, Mich.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Improved Method of Anodizing and Coloring Aluminum Rivets

An improved method of anodizing and coloring aluminum rivets that gives greater uniformity and eliminates spot or contact marks on the rivet heads has been placed in operation at the Technical Processes Division of Colonial Alloys Co., Ridge Ave. and Crawford St., Philadelphia 29, Pa. This process is particularly suitable where the heads of the rivets are decorative, and may be used in combination with chemical polishing. After chemical polishing, the rivets are subjected to anodizing in accordance with the new technique, a brilliant protective coating being produced that is hard, abrasion- and corrosion-resistant, and will not peel off. 201

Light-Weight Plastic Foam Material with Good Insulating Qualities

Plastic foam insulating material that combines exceptionally low thermal conductivity with very light weight is being produced by the United States Rubber Co., New York City, for low-temperature installations. Present applications include shipping containers for fresh and frozen foods and refrigeration units.

Because of the insulating properties of the plastic foam, walls in installations can be thinner, thus increasing storage capacity. Other advantages of the material, known as "Flotofoam," are that it is non-corrosive, non-toxic, and self-extinguishing. It will not support mold or bacteria growth, and holds its insulating value over a wide range of mean temperature. 202

Pre-Lubrication Protection for Engine and Machine Parts

A compound for the pre-lubrication of engine and machine parts before assembly has been placed on the market by the AP Parts Corporation of Toledo, Ohio. This compound identified as dgf-123, is a dispersion of synthetic colloidal graphite in alcohol and carbon tetrachloride. The rapid evaporation of the liquid carrier leaves a dry coating of graphite that provides protection against metal-to-metal contact before a lubricant is applied.

As a pre-lubricant, this compound serves the dual purpose of reducing the surface tension of the metal, thus allowing friction generating surfaces to retain a thicker film of oil, and of acting as a wetting agent to distribute the oil film. It will also serve as a temporary lubricant should the regular oil film be ruptured by sudden shock, intense heat, or failure of the oil supply....203

Air-Drying Prime Coat Having High Adhesion

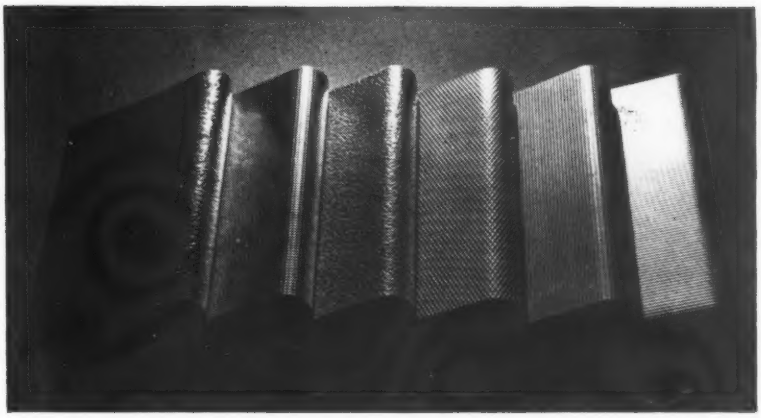
A quick-drying anti-corrosive underprimer that combines metal surface treatment with high anchorage of top coats and excellent adhesion to a variety of surfaces is now being produced by the Dennis Chemical Co., 2701 Papin St., St. Louis, Mo. This prime coat is suitable for use on such metals as cold-rolled steel, aluminum, nickel, copper, and stainless steel.

Although this underprimer, known as "Perma-Skin," is an air-drying material, superior adhesion is obtained in most instances. On ferrous surfaces, corrosion is inhibited by phosphatization and action of the contained pigments, resulting in a strong bond and protection against underfilm corrosion. The primer can be used with practically all conventional finishing materials, such as oleoresinous paints, alkyds, baking enamels, lacquer, etc. 204

Cast-Magnesium Bottom Boards Used to Hold Foundry Flasks

Cast magnesium is replacing the conventional wooden bottom boards used by foundries to hold flasks when pouring and molding sand castings in ferrous and non-ferrous metals. The magnesi-

New Form of Aluminum Sheet with Raised Patterns which Provide Attractive Appearance and Eliminate Need for Finishing Operations



um boards eliminate burning, warping, splitting and loose joints which cause mold shifts, breaks, and cracks—all common problems when wooden bottom boards are used. The magnesium models provide a solid, level base on the floor or conveyor equipment, and normal run-outs and spills of molten metal will not harm them.

Magnesium bottom boards are cast either by the sand or permanent mold process in a single piece and have vent-holes in the bottom to permit the escape of gases, help retain sand permeability, and give firm, equal distribution of pressure. These boards are produced by the Christiansen Corporation, Chicago, Ill., under the name "Edco Dorometal" bottom boards..205

Aluminum Sheet Embossed at Mill in Variety of Patterns

Matched roller-die embossing machines are being used by the Reynolds Metals Co., Louisville 1, Ky., to produce aluminum sheet with raised patterns, such as squares, diamonds, stucco, simulated grained leather, as well as ribs crosswise and lengthwise. The deeply embossed patterns, shown in the accompanying illustration, are so attractive that additional surface finishing is usually unnecessary. The patterns also tend to hide scratches and other evidences of rough usage and wear. 206

Compound that Protects Metal Surfaces while Joining

In welding or soldering, "thin-flowing" alloys are likely to flow over the surrounding surfaces, in addition to the welding or soldering area. To obviate this trouble, a new compound designated "Anti-Capillary Compound" has been developed by the Eutectic Welding Alloys Corporation, 40 Worth St., New York 13, N. Y. The new compound limits the flow of the metal and helps retain it in the working area. It can be used with any form of oxy-acetylene gas torch, soldering torch, soldering iron, furnace, or high-frequency equipment. Its use decreases materially the dangers of distortion and discoloration of the parent metal surfaces. 207

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in September, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME.. POSITION OR TITLE..................................
[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM..

BUSINESS ADDRESS...

CITY..STATE...

One-Hundredth Anniversary of Ansonia Plant of the Farrel-Birmingham Co.

IN 1848, Almon Farrel and his son, Franklin, built a foundry and machine shop in what is now Ansonia, formerly part of the town of Derby, Conn. The principal products were brass and iron castings, wooden mortise gears, and parts for water-power plants. The firm was first known as Almon Farrel & Co. In the following years, several changes took place in the name of the company and in the partnership until, in 1857, the concern was incorporated as the Farrel Foundry & Machine Co. Franklin Farrel became president in 1869 and continued as head of the company until his death in 1912.

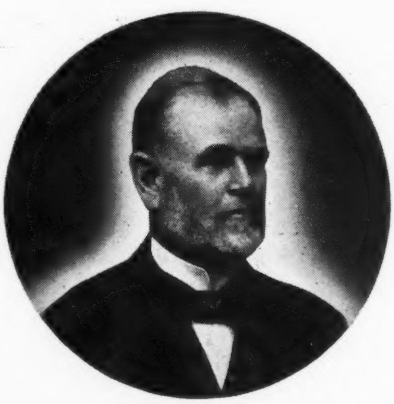
In supplying the needs of the growing New England industry, the company met its early opportunities. The firm specialized in heavy castings and in the manufacture of rolling mill equipment for the rapidly expanding copper and brass industries. It also pioneered in the development of processing machinery for the rubber industry, which was commencing its important growth following the discovery of vulcanization by Charles Goodyear in Naugatuck in 1839.

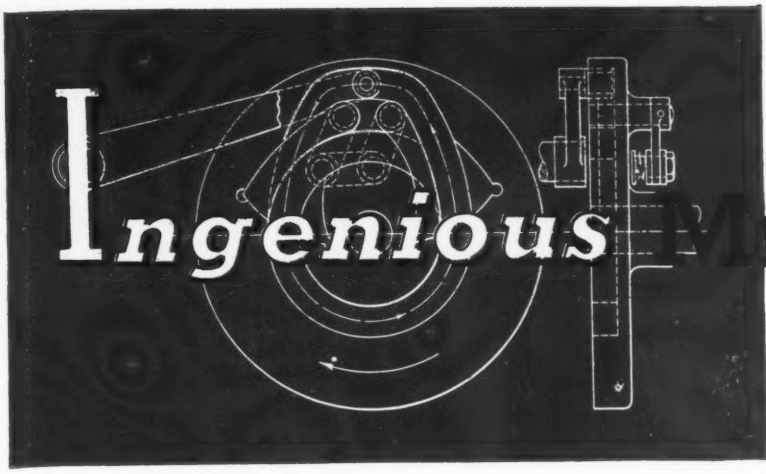
The Farrel plant engaged in the manufacture of equipment for several other industries which were fast gaining ground in the western hemisphere. One was the paper industry, for which rolls and calenders have been made at Ansonia for over three-quarters of a century; another the cane sugar industry, which at this time was attaining a foothold in the West Indies. The company began the manufacture of cane mill equipment in 1870, and as early as 1890, two large mills, weighing 320 tons each, were shipped to Cuba. Stone and ore crushers also became important products, as well as chilled-iron rolls for the grain industry and machines for grinding rolls to high standards of accuracy and finish.

In 1920, the company acquired another plant in Buffalo, N. Y., to take care of the increased demand for its products and to specialize in the manufacture of gears, gear drives, and gear generating machines. With this new phase of the business, came the acquisition of American rights to the Sykes gear generating process.

In 1927, a merger took place, uniting the Farrel Foundry & Machine Co. and the Birmingham Iron Foundry, another organization that had been established in the neighboring city of Derby in the year 1836. The two companies were incorporated under the present name of the Farrel-Birmingham Co., Inc. Throughout the years, the Farrel family has maintained an interest in the business, and today a considerable number of direct descendants of the founders are officers and directors of the concern.

(Left) Almon Farrel and (Right) Franklin Farrel, His Son, who Founded Almon Farrel & Co., in Ansonia, Conn., One Hundred Years Ago. The Present Plant of the Company (Now Known as the Farrel-Birmingham Co.) is Shown at the Top of the Page





Ingenious Mechanisms

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

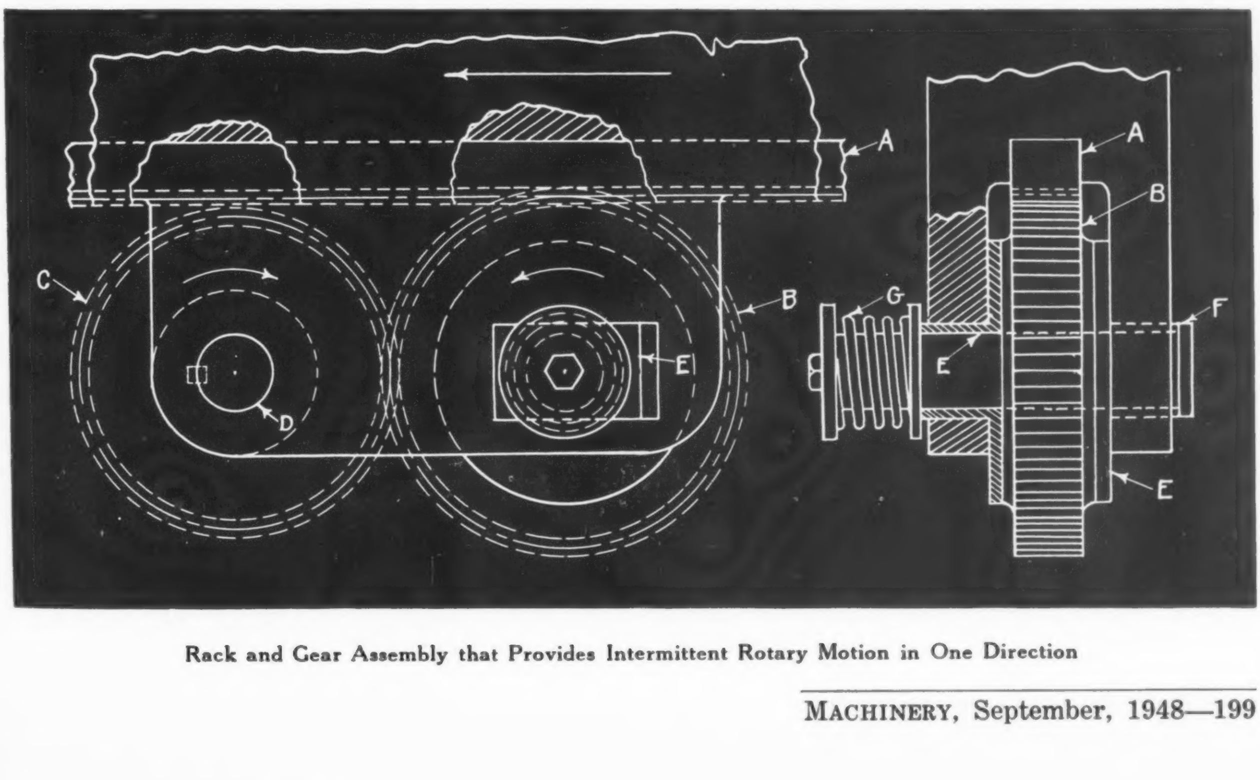
Rack and Gear Assembly for Intermittent Rotary Motion

By L. KASPER

In the design of a wire-forming machine, a shaft was required with an intermittent rotary motion that exceeded the radial travel obtainable with ordinary ratchet and pawl mechanisms. The rack and gear assembly illustrated provided the desired motion efficiently. The reciprocating rack *A* meshes with gear *B*, to which it transmits an alternating rotative movement. Gear *B* is in mesh with gear *C*, which is smaller in diameter than gear *B* and does not mesh with rack *A*. Gear *C* is keyed on shaft *D*, which is given an intermittent, rotary motion in one direction.

Driving gear *B* is splined to shaft *F*, which is supported by two flanged bearings *E*. Bearings *E* are rectangular in section where they pass through the supporting member. The rectangular sections of bearings *E* are mounted in rectangular slots, which are somewhat longer than these sections to permit a horizontal sliding movement of the bearing. The hubs of gear *B* are of large diameter and are in contact with the flanges of bearings *E*. Shaft *F* is flanged on one end and is provided with a spring *G* on the opposite end, the pressure of which draws bearings *E* together so as to apply frictional resistance to the rotative movement of gear *B*.

As illustrated, rack *A* is moving in the direction indicated by the arrow, causing gear *B* to rotate in the same direction. Gear *B*, meshing with gear *C*, causes it and shaft *D* to rotate in the reverse direction. When the movement of rack *A* is reversed, the tendency for gear *B* to rotate in the reverse direction also is resisted by the friction applied through spring *G*. Inasmuch as there is no resistance to the horizontal move-



Rack and Gear Assembly that Provides Intermittent Rotary Motion in One Direction

Fig. 1. Abrasive-wheel Dresser in which a 10 to 1 Templet is Employed for Hydraulically Controlling Form Dressed on Grinding Wheel

ment of bearings E, the latter will slide in the rectangular slots, thus disengaging gear B from gear C. When bearings E come in contact with the ends of the slots, further sliding movement is prevented, and continued movement of rack A causes gear B to rotate; however, as gears B and C are out of mesh, no rotary motion is transmitted to gear C. When the movement of rack A is once more reversed (being then in the direction indicated by the arrow), bearings E immediately slide gear B into mesh with gear C and shaft D is rotated.

An idler between gears B and C will permit rotation of shaft D in the opposite direction to that illustrated.

Abrasive-Wheel Dresser Controlled Hydraulically from Templet

By NILS HOGLUND

The abrasive-wheel dresser illustrated in Fig. 1 operates on a 10 to 1 ratio from a templet that controls the movement of the diamond dressing tool through a stylus. As shown, the operator moves the templet with his left hand while keeping the stylus approximately perpendicular to the edge of the templet with his right hand. The templet contour is duplicated on the work in the reduced scale required through a closed system of differential hydraulic cylinders. The contour dresser was developed by the Hoglund Engineering Co., Inc., 697 Selfmaster Parkway, Union, N. J.

As shown in Fig. 2, the templet A is bolted to a slide B which can be moved longitudinally along bar C by rotating handle D. A pinion fastened to one end of the handle-shaft meshes with a rack mounted on the bar. A piston E is mounted on the slide so that it moves the same distance as the templet. An O-ring seal F is provided on the right-hand end of the piston within cylinder G.

When the templet is moved in the direction indicated by the arrow, piston E forces the hydraulic fluid in cylinder G through by-pass valve H and hollow piston J to the left-hand end of cylinder L. Since piston J is rigidly fixed to frame N of the dressing tool, cylinder L will move to the left as the fluid is forced into it. Connected to this movable cylinder is member M which slides in dovetailed slots on frame N. When the templet is moved in the opposite direction, the hydraulic fluid will be forced back into cylinder G by the action of spring S on cylinder L.

Ratio arm O is designed to pivot about point K on slide M. Stylus P and the diamond dressing tool Q, which are both mounted on the ratio arm, will therefore move in planes parallel to slide M and exactly the same distance as the slide.

When the templet is moved a distance X, slide M will move a distance Y, where:

$$\frac{Y}{X} = \frac{\text{Cross-sectional area of small cylinder } G}{\text{Cross-sectional area of large cylinder } L}$$

Meanwhile, the diamond dressing tool will travel the distance Y axially across the grinding wheel W and stylus P will travel a distance Z in a direction opposite to that of the templet. The relative movement of the templet and the stylus is therefore equal to $X \div Z$, which must be proportionate to the distance Y that the dressing tool travels, or in the desired ratio of 10 to 1. It is apparent that the ratio of the hydraulic system cannot be the same as the desired ratio of the mechanism.

Expressed geometrically:

$$\frac{X + Z}{Y} = \frac{10}{1}$$

However, since $Z = Y$, this formula can be expressed:

$$\frac{X+Z}{Z} = \frac{10}{1}, \text{ or } = X = 9Z$$

It follows that the relative cross-sectional areas of cylinders L and G must be in the ratio of 9 to 1 in order to obtain the desired 10 to 1 reduction ratio in the relative movements of the templet and the dressing tool.

The contact point of the stylus, the tip of the diamond dressing tool, and point K about which the ratio arm pivots all lie in a straight line. Also, the stylus handle and the dressing-tool head are connected by means of a parallel arm R, so that the diamond and stylus are always parallel to each other. The distance from the dressing tool to pivot point K is made one-tenth of the distance from the stylus to the pivot point. The rounded nose on the stylus has a radius ten times that provided on the diamond.

The dresser need not be attached to the machine, and can be easily adjusted for various jobs by simply changing the templet. Sliding parts of the dresser are protected from dust by neoprene bellows type covers. Grinding wheels as large as 10 inches in diameter by 1 1/8 inches wide can be dressed, and the height from the base of the tool to the center line of the diamond is 8 5/8 inches.

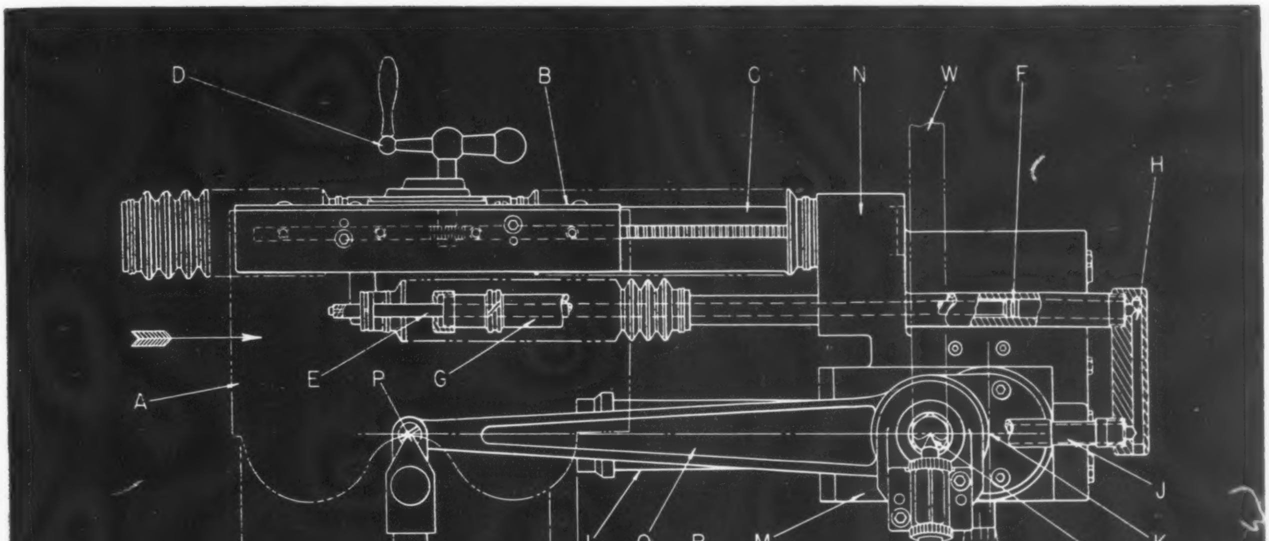


Fig. 2. When Templet A is Moved to the Right, Hydraulic Fluid in Cylinder G is Forced into the Left-hand End of Cylinder L to Move the Diamond Dressing Tool Q across Grinding Wheel W

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Special Nose Type Chuck for a Solid-Spindle Lathe

By DONALD A. BAKER, Boonton, N. J.

An old-time lathe with no hole through the spindle brought about the design of the chuck shown in the accompanying illustration for facing and turning shell *Z*. Actually, two of these chucks were made. One was designed for use on a lathe with a hollow spindle, and hence could be operated with a regular lever type draw-back, while the other had to be cam-operated.

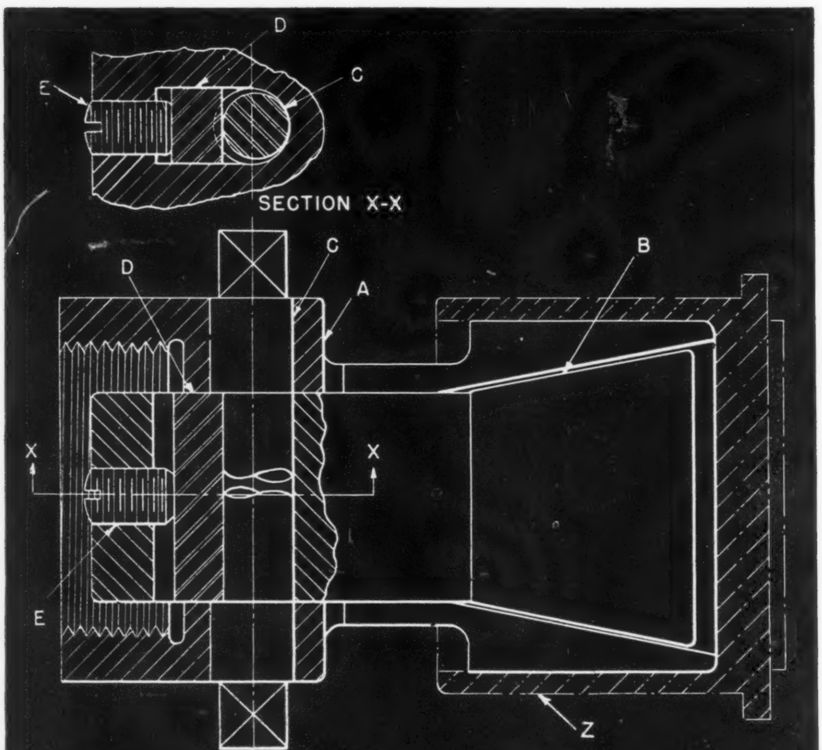
Referring to the illustration, *A* is the body of the chuck. It is made of machine steel and has a typical split, hardened and ground end. Into this end is inserted the expanding plug *B*, which is bored and slotted as shown in the sectional view. The object of this construction is to provide clearance for the camshaft *C;* as will be noted, however, it is not necessary to slot the main chuck body. The cam rests against a steel plate *D* which is held in the assembly by the set-screw *E*.

In operation, a part is placed over the nose of the chuck and a wrench is used to turn the square end of the camshaft. The action of the cam forces plug *B* back into the chuck, thus expanding it and holding the work.

Quick-Acting Fixture Designed for Double Counterboring

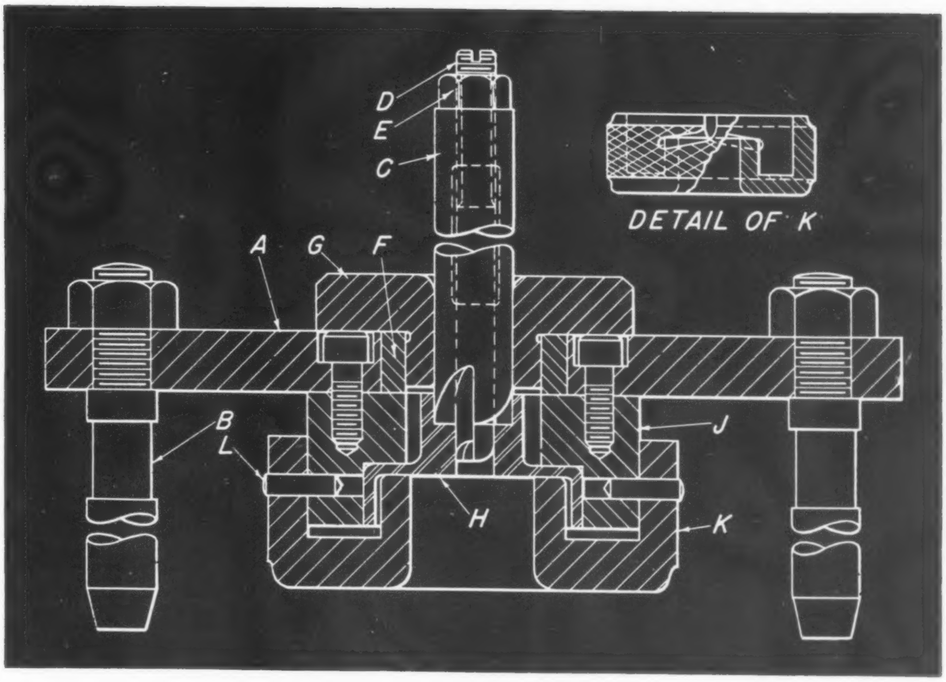
By ROBERT MAWSON, Providence, R. I.

A fixture, designed to be quickly loaded and unloaded, was developed by the Sterling Tool Co., Central Falls, R. I., for machining double counterbores in special collars within close tol-



Chuck Assembly, Consisting of Chuck Body A and Cam-operated Expanding Plug B, Used to Hold Work-piece Z in an Old-time Lathe that Had No Hole through the Spindle

Fixture for Accurately Locating and Quickly Clamping Collar H while it is being Counterbored by Tools C and D



erances. As shown in the accompanying illustration, the fixture consists of a square cold-rolled steel plate *A*, supported at each corner by a tool-steel post *B*. The lower ends of these four hardened posts are ground at assembly, so that the fixture will be accurately aligned with the counterboring tools when it is placed on the table of the drilling machine.

The large-diameter counterboring tool *C*, which is rotated and fed by the drilling machine spindle, is bored and internally threaded at its upper end to accommodate the smaller tool *D*. The top of tool *D* is slotted to permit vertical adjustment with relation to the large tool. When the proper setting has been made, nut *E* is tightened to hold the two tools securely in the desired relative positions. The depth of cut can be controlled by a special collar located on the drilling machine spindle.

A hardened and ground tool-steel liner *F* is pressed into the center of plate *A*. A tool guide bushing *G* is prevented from being rotated or lifted from the liner by a set-screw (not shown). The special collar *H* to be counterbored is located in a hardened and ground tool-steel block *J* and clamped by lock-nut *K*. Block *J* is held on the under side of the fixture plate by means of four socket-head cap-screws and two dowel-pins. Two pins *L*, spaced 180 degrees apart and pressed radially into this block, slide in the bayonet-lock slots of nut *K* when the collar is being loaded or unloaded. A detail view of the casehardened, machine-steel lock-nut is shown at the upper right-hand corner of the illustration.

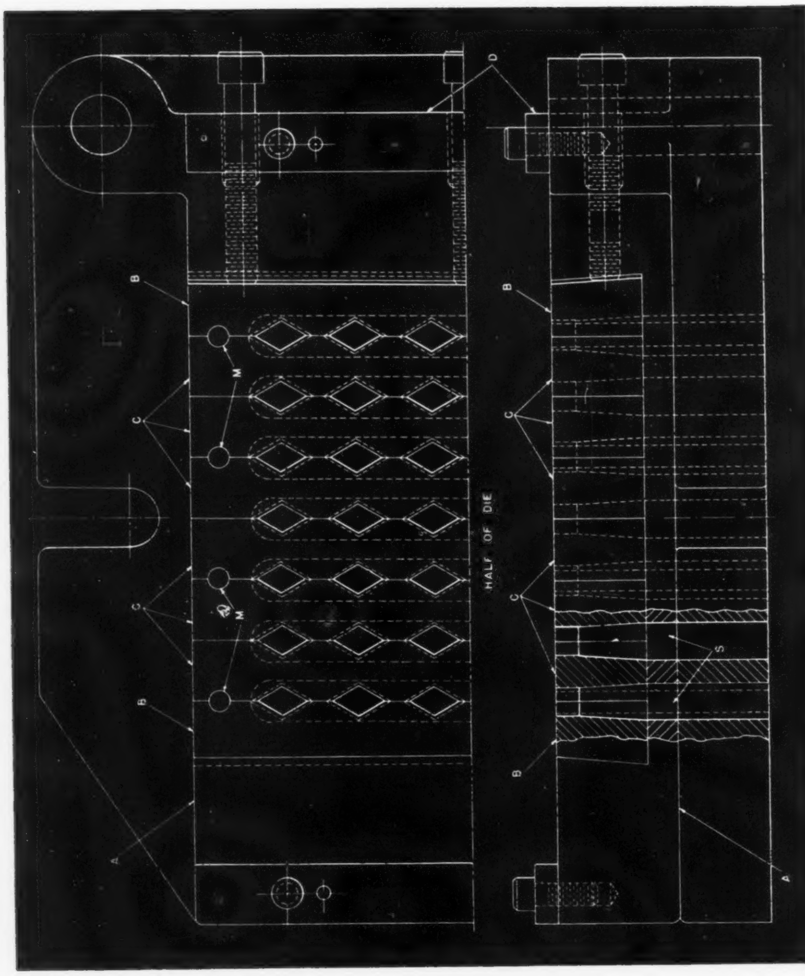
Die Set for Perforating Sheet Metal

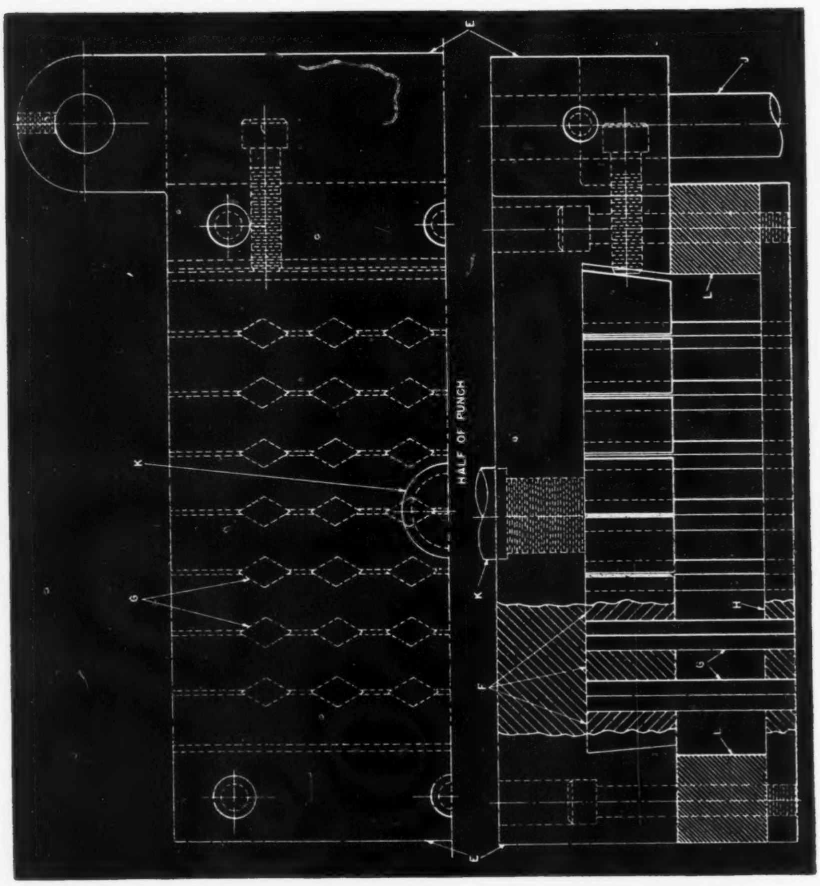
By HAROLD E. MURPHEY, Westerly, R. I.

To provide ventilation openings in steel locker-doors, holes can be punched in the sheet metal by means of the relatively simple perforating die set shown in the accompanying illustration (see page 204). The use of sectional dies and individual punches facilitates the manufacture and maintenance of this die set.

The bottom or die part of the set consists of die-block *A*, eight die sections *B* and *C*, and stock guide blocks *D*. The die-block is provided with seven cored slots *S*, which allow the scrap to fall through to the bottom of the press. The six die sections *C* are machined on both edges to form diamond-shaped openings when they are in position. The two end die sections *B* are beveled along one of their edges to fit the mating dovetail in the die-block.

The die sections are easily shaped from tool steel on milling machines equipped with form cutters. Before hardening, the machined sections are located in the die-block and securely clamped by means of three cap-screws, after which four dowel-pin holes *M* are drilled and reamed through the die-sections and block. The die-sections are then removed from the block and hardened. After hardening, they are reassembled in the block and dowel-pins are driven into place to align them. The upper face of this assembly is finished by mounting on the table of a surface grinding machine. Stock guide plates *D* are then secured to the die-block with cap-screws.





End and Half-plan Views of Punch and Die that are Used to Perforate Sheet Metal

The upper or punch part of the die set consists of a cast-iron punch-block *E*, eight punch-holder blocks *F*, the diamond-shaped punches *G*, stripper plate *H*, stripper pads *L*, guide pins *J*, and stud *K*. Punch-block *E* is dovetailed to accommodate the two end punch-holder blocks which are beveled on one side to fit the dovetail slots.

The punch-holder blocks are made sectional, similar to the die construction, except that they are not hardened. After the vees have been milled in the sides of these blocks, the sides are planed to provide approximately 1/16 inch clearance between adjacent blocks when the punches are clamped in place. The hardened and ground punches *G* are commercially available, standard products. Stripper *H* is a one-piece, cold-rolled steel plate with diamond-shaped openings slotted in it.

The two stripper pads *L* are made of rubber, and each is provided with three holes for cap-screws. The use of rubber pads insures an even stripping action, and it has been found that such pads last longer than conventional springs. Stud *K*, which fits into a counterbore and a threaded hole in punch-block *E*, is designed to fit the press ram.

After assembling the punches, punch-holders, and punch-block, the ends of the punches are ground. The punch and die are then fitted together and holes are drilled and reamed through both blocks to accommodate pilot-pins *J*. Assembly of pilot-pins, stripper plate and pads, and stud *K* completes the die set.

Producing Wide Stainless-Steel Sheets at Republic Steel Corporation's New Plant

COILS of hot-rolled stainless steel up to 60 inches wide and 0.300 inch thick can be cold-reduced to flat sheets at the new Enduro Plant No. 2 of the Republic Steel Corporation in Massillon, Ohio. The processes performed in producing stainless-steel sheets at this plant are as follows:

Cold-Reducing—Reducing the thickness of the steel by passing it between the rolls of the "cold mills."

Annealing—Heating the steel to a temperature of 1450 to 2000 degrees F. and controlling the cooling to remove the hardness imparted to the steel by rolling.

Pickling—Removing scale by passing the steel through an acid bath, washers, and scrubbers.

Slitting and Cutting—Cutting to sizes specified by the customer.

The hot-rolled coils are passed through one of the breakdown anneal-and-pickle lines before cold reduction. This is to soften the steel and insure its cleanliness. To cold-reduce stainless steel from hot-rolled coils ranging up to 0.300 inch thick down to the finished gages, some as thin as 0.015 inch, may require as many as three reductions, consisting of an average of seven passes each, through the mills. Since each pass increases the hardness of the steel, it is necessary to anneal and pickle the steel after each reduction. Following the final annealing and pickling, the steel is passed through the rolls of the "skin pass" mill. The relatively slight pressure of this mill makes no further reduction in thickness of the steel, but imparts a smooth, dense surface, as well as physical characteristics to suit its ultimate use. The steel is then cut to the required sheet sizes, and if a high luster or mirror finish is desired, the sheets are sent to the grinding and polishing department.

Speeds on the breakdown anneal-and-pickle lines range from 4 to 24 feet per minute. Each line consists of two coil boxes and two uncoiling levelers; an arc welding carriage to join coil ends; a looping pit; a tension stand; an annealing furnace (with provision for passing the strip over the top of the furnace when pickling only is required); a quench tank; three acid pickling tanks, each 40 feet long, equipped with hoods and fume exhausters; a scrubber; a blower and dryer; pinch rolls; a down-cut shear; a run-out roller conveyor; and two down coilers. Similar lines are provided for intermediate and finish annealing and pickling.

The 66-inch rolling mill is a one-stand, four-

Fig. 1. Two Cold-reducing Mills Installed in the New Massillon, Ohio, Plant of the Republic Steel Corporation. These Mills are being Used for Rolling Stainless Steel in Sheet Sizes Never before Produced Commercially by This Method. The Machine in the Foreground of the Illustration is a 54-inch Size Mill, while the Machine in the Background is a 66-inch Size Mill

high, cold-reducing mill which will roll coils up to 60 inches wide and will make reductions from a maximum gage of 0.300 to a minimum of 0.015 inch. The mill is driven by a 2000-H.P. direct-current motor. Work-rolls are 16 1/2 inches in diameter with 66-inch faces and weigh 5940 pounds each. Back-up rolls are the same width and 56 inches in diameter; their weight is 69,450 pounds.

Coils are fed to the mill by a floor level conveyor at the rate of from 25 to 30 feet per minute. The coil is lifted hydraulically to the pay-off reel and the strip passes through a roller leveler with five 8-inch diameter rolls. The mill operates at 250 to 500 feet per minute, and the steel is taken up on a hydraulically expanding and collapsing reel. An unloading device discharges the coil.

Equipment on the 54-inch mill is identical with that on the larger mill except for the width of the rolls and minor differences accounted for by the lesser weight of coils rolled on this mill. Both mills are equipped with paper winders and unwinders for removing paper from the coils or recoiling paper with the steel after finishing passes have been made.

A roll grinder for resurfacing work-rolls has a 28-inch swing and is 168 inches between centers. It is equipped for crowning and concaving rolls. A 36-inch heavy-gage slitting machine will handle stainless-steel coils from 10 to 36 inches finished slit width, weighing up to 12,000 pounds, with a maximum thickness of 0.300 inch. It will make two cuts in this heavy-gage material or six cuts in material 0.1875 inch thick or thinner. A scrap chopper cuts scrap into 2- to 6-inch lengths at the rate of 124 to 496 cuts per minute. The slitter operates at 60 to 240 feet per minute. A 48-inch side trimmer is also installed for heavy-gage material.

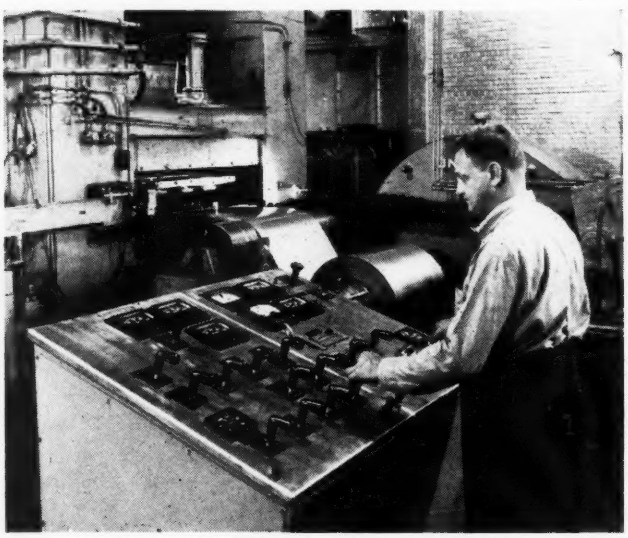


Fig. 2. The New Republic 54-inch Cold-reducing Mill is Controlled from This Table. It Can be Controlled from a Similar Table on the Other Side when the Mill is Reversed, Permitting the Operator to Watch the Material as It Enters the Rolls

* * *

Clock Bearing Plates Made from Aluminum

Recent tests on aluminum bearing metal reveal another use for this light metal. The latest adaptation is in the manufacture of clock plates carrying pivot bearings. In a test just completed by one of the nation's leading clock manufacturers, it was shown that aluminum can be used advantageously to replace clock parts which have previously been made of other materials. Aluminum parts were substituted for brass parts in the test, and were subjected to the same highly accelerated running conditions used in testing other materials.

In this experiment, a standard movement was used, with the bearing plates made of 24S-T aluminum alloy having a thickness of 0.072 inch. These aluminum plates were stamped, drilled, finish-reamed, and countersunk approximately 1/64 inch. Aluminum is especially adaptable to these operations because, in addition to stamping easily, it lends itself readily to machining.

In order that the test might be completed rapidly, a "fly" or wind wheel was used in place of the usual escapement, thus accelerating the unwinding period at a ratio of approximately 3600 to 1. This meant that the minute arbor which normally makes one revolution per hour was accelerated to sixty revolutions per minute. The second arbor with a normal speed of one revolution per minute was accelerated to 3600 revolutions per minute. Under these conditions, the test ran in cycles (intermittent) for twenty-eight days—the equivalent of approximately ninety-two years of clock operation.

At the beginning of the test, a small amount of refined, light instrument oil was applied to all the pivots. The play in the bearings was accurately measured, each showing play amounting to approximately 0.002 inch. At the end of the twenty-eight-day test, is was found that the play in the minute arbor had increased to 0.004 inch, while the amount of play in the second arbor, because of the excessive speed at which it had revolved, had increased to 0.006 inch. The test demonstrated conclusively that aluminum is suitable for this application.

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Sales Engineering Consultant

Sell Human Values of Metal-Working Equipment

THE advance of mechanization and the mass production of interchangeable parts have created enormous problems relating to the satisfaction and happiness of the operator of machine tools and other equipment in the metal-working industries. At first, the machine was designed with a single purpose—to perform the operation. Modern machines are not only designed to do the job, but they are also devised and fashioned to suit the men who spend many hours associating with them.

Three of the five senses—touch, sight, and hearing—channel impressions to the mind of equipment buyers and help crystallize opinion. Besides ease of operation, based upon the inherent mental and physical characteristics of human beings, are features that can build up pride in ownership. When a machine can be demonstrated as one that helps to make employes happy and more satisfied, its advantages extend much further than "slide-rule" calculations indicating exact dollar returns.

Preceding articles discussing the problems of sales engineers have dealt with direct economic results. Let us take a look at selling the social and psychological results obtained with new equipment. These are of great indirect economic importance. Let us see how the sales engineer can help his customer, and thus indirectly help himself to get orders, by selling human factors —in other words, selling morale as an aid to uninterrupted production.

Operational Suitability of the Machine—"Look," says the sales engineer in demonstrating the motions of the operator, "each step in the cycle has been studied from the operator's viewpoint. My position is natural. As I use my body, arms, and hands, each subsequent motion follows easily. Now, with the old machine, you had to twist your body and reach away over there . . . why, this machine is designed for the man . . . think how it cuts down fatigue . . . it helps the workman and supervisor."

Effort Required—Then the sales engineer asks the prospect to reach for this or that handle. He shows him not only how conveniently it is placed and how shaped to fit the hand, but especially how easily it is actuated. He points out that this ease of operation implies superior machine design and workmanship. He dramatizes the fact that the operator ends the day a happier man.

Appearance—Shape, size, color, and finish all greatly affect the market value of any object sold to the individual, whether it be a coat-hanger or an automobile. The same holds true more and more of factory tools, for corporate bodies do not select such equipment—individuals do. Attractive tools make the factory a pleasanter place in which to work. The sales engineer should carry this point home convincingly to those in charge of equipment purchases.

Noise—Many studies have been made that prove the advantages to employes of quiet surroundings. Excessive noise in machinery suggests undue friction and wear, while quiet operation signifies quality and efficiency. Sell quiet operating characteristics, both in terms of machine quality and wear and tear on the operator.

Cleanliness and Neatness—Sell the idea of "good housekeeping" for shop and machine. When you can demonstrate that any machine tool has clean habits—handles the work, lubricant, and coolant well and disposes of chips and cuttings—then you establish value. Value in no small degree, through adding to the comfort and happiness of workmen!

Light and Sight—"Note particularly that speed-changer dial," says the sales engineer. "The figures are bold and clear. The operator can't make a mistake; it's much easier on him than the old machine. He will like it because there is less strain on him. And then there is the serial number of the machine. You don't stand on your head to read it. That helps your maintenance man in ordering parts."

These are only a few of the merits of modern machines that help solve problems of employe relationships. They are present in the equipment you sell, but do you make them appealing and real? Do they take the prominent part they should in personal selling? Do they appear in sales literature and advertising or are machinery builders so involved in selling the economics of the machine that they fail to take full advantage of these other important selling values?

In selling machinery, do not overlook the human values of the equipment.

* * *

New Metallizing Association

The American Metallizing Contractors Association was organized some months ago in St. Louis, Mo., and recently held its second meeting in Cleveland, Ohio. The purposes of the organization are to promote the welfare and prosperity of the metallizing contract industry and to increase the interest of the public in matters pertaining to that industry; to foster cooperation among the members and the industries they serve; to collect and disseminate statistical data pertaining to the industry; and to engage in scientific and educational work without pecuniary profit.

William H. Fatka, of Chicago, Ill., is president, and Harry W. Moore, of Tulsa, Okla., is vice-president. Walter B. Meyer, secretary-treasurer, maintains an office at 773 Brownell Ave., St. Louis 22, Mo.

* * *

Materials-Handling Film and Manual

A film entitled "Materials Handling in Receiving, Warehousing, and Shipping," which stresses the advantages of modern materials-handling equipment and methods, has been announced by the General Electric Co. This film and a 96-page application manual are used in General Electric's "More Power to America Program."

The 16-millimeter color-sound film illustrates the fact that materials handling is one of industry's largest costs, and shows outmoded materials-handling techniques, various types of modern materials-handling equipment, advantages of the palletized unit-load method of shipping, and examples of many different conveyor systems.

The illustrated application manual lists the available types of materials-handling equipment and describes their application. It also explains how to make a materials-handling survey.

Lincoln Foundation Announces Awards in Undergraduate Program

Awards of $1000 to the University of Cincinnati, $500 to the University of Minnesota, and $250 to Iowa State College have been announced by the James F. Lincoln Arc Welding Foundation. These awards are to be used for providing scholarships. They represent the top honors in the Foundation's first annual Engineering Undergraduate Award and Scholarship Program, in which awards are given to engineering undergraduates for the preparation of papers on arc-welding and its uses.

The scholarship funds are awarded to the schools in which the authors of the three best papers were registered, and duplicate cash awards were made to each author. Alan R. Cripe, of the Department of Architecture, University of Cincinnati, received the first award of $1000; William David McCoy, Electrical Engineering Department, University of Minnesota, was awarded the second prize of $500; and William W. Robinson, Mechanical Engineering Department, Iowa State College, won the third award of $250. In addition to these, smaller awards totaling $3500 were made to sixty-eight undergraduates.

The closing of this program marks the end of the first of a ten-year series of annual competitions for engineering students.

* * *

Willard H. Dow to Receive ASM Medal

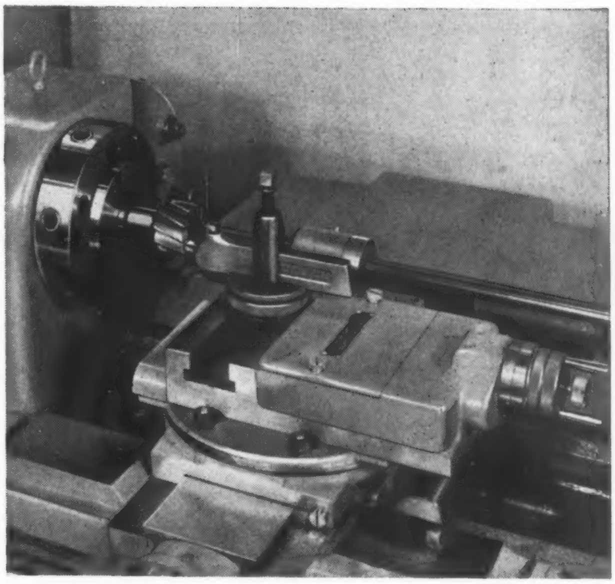
The American Society for Metals has announced that Willard H. Dow, president of the Dow Chemical Co., Midland, Mich., has been chosen to receive the Society's medal for the advancement of research for 1948. Presentation of the medal, plaque, and citation will be made at the annual banquet of the Society to be held in Philadelphia on October 28, during the National Metal Congress and Exposition.

* * *

Welding and Cutting Instruction Books

Students, instructors, professional welders, and design engineers will be interested to know of the availability of a series of welding and cutting instruction books published by the Air Reduction Sales Co. A folder describing the contents of these books and giving the list prices is obtainable by writing Department A19-24P, Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

Shop Equipment News



Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Sidney Universal Relieving Attachment

The Sidney Machine Tool Co., Sidney, Ohio, has developed a new universal relieving attachment which can be applied to Sidney lathes already in use, as well as to new machines. This attachment is provided with a 4-to-1 ratio speed reducer that is integral with the change-gear box, thus eliminating the need for two-speed motors or other devices for reducing spindle speeds.

The attachment is adapted for relieving the teeth of hobs, as shown in Fig. 1, straight or tapered reamers, form cutters, and milling cutters with either straight or helical teeth. It can also be used for relieving the teeth or cutting edges of internal cutters and threading dies, as well as cutters having angular or spiral teeth. End-cutting teeth of end-mills can be relieved with the attachment arranged as shown in Fig. 2.

In Fig. 3, the taper attachment guard is shown in the raised position to give a clear view of the right-angle drive from the change-gear housing to the compound rest. This arrangement eliminates universal joints and permits the driving mechanism to be mounted on the back of the lathe.

The change-gear housing, with the index-plate located in full view of the operator, is shown in the rear view, Fig. 4. A timer *A* is provided to enable the operator

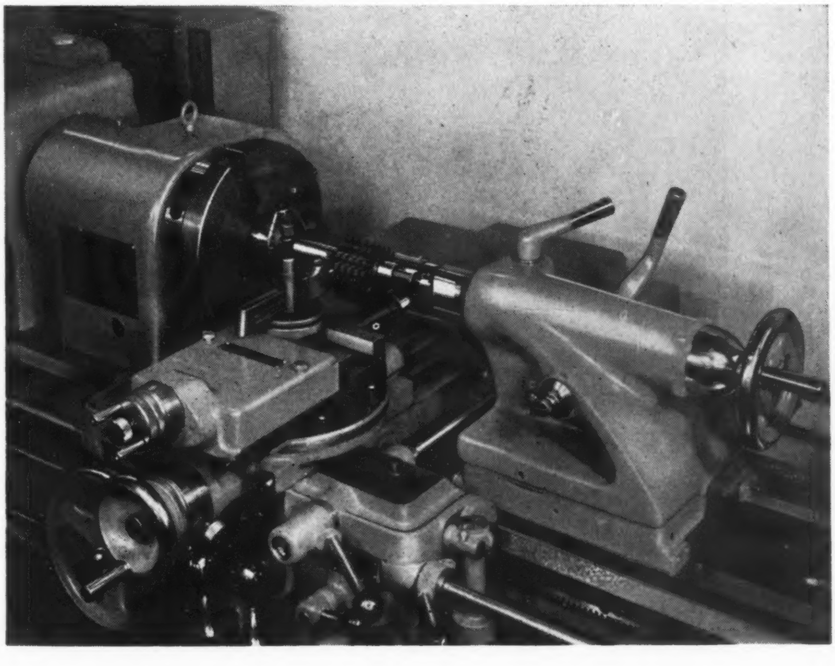


Fig. 1. (Left) Sidney Universal Relieving Attachment Set up for Relieving the Teeth of Hobs

Fig. 2. (Above) Sidney Universal Relieving Attachment Arranged for Relieving the Teeth of End-milling Cutters

To obtain additional information on equipment described on this page, see lower part of page 240.

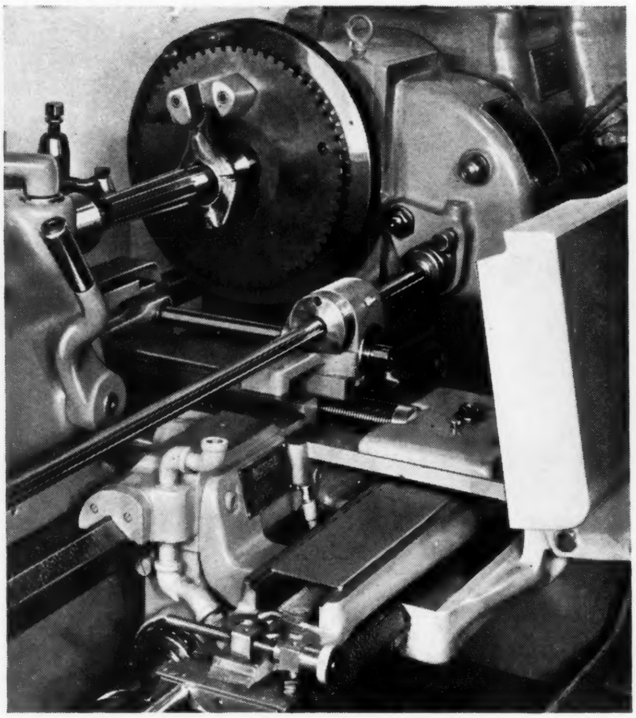


Fig. 3. Taper Attachment Guard of Sidney Universal Relieving Attachment Raised to Show Right-angle Drive from the Change-gear Housing to the Compound Rest

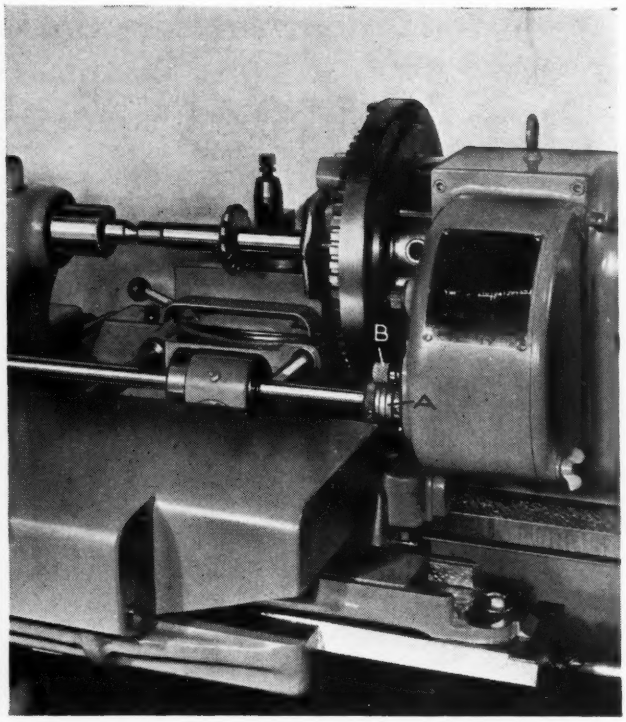
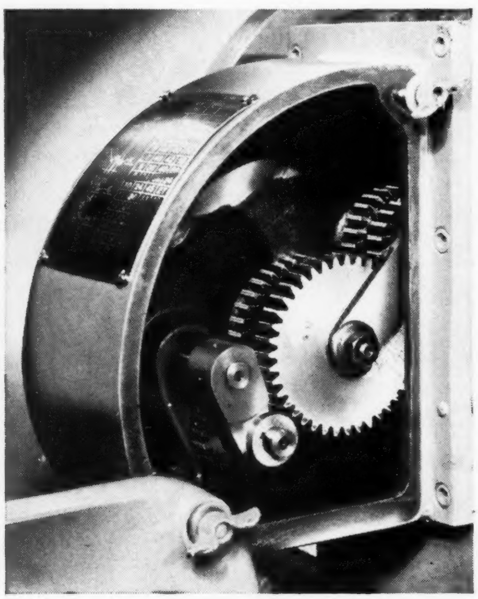


Fig. 4. Rear View of Change-gear Housing, Showing Timer A, which Permits Operator to Pick up Any Relief at Any Desired Point with Universal Relieving Attachment

to pick up any relief at any point with a minimum of effort. The relieving attachment can be disengaged to permit conventional turning operations by means of the clutch lever *B*. The change-gears are easily accessible by opening the cover of the change-gear housing, as shown in Fig. 5, and swinging the quadrant to the front of the opening. The cam throw of the relieving attachment can be quickly adjusted by loosening the stud *A*, Fig. 6, and sliding the arm to the required location in shoe *B*. 61

Lincoln Hard-Surfacing Electrodes

The Lincoln Electric Co., Cleveland 1, Ohio, has recently added to its line of hard-surfacing electrodes, coated tubular type electrodes for depositing weld metal



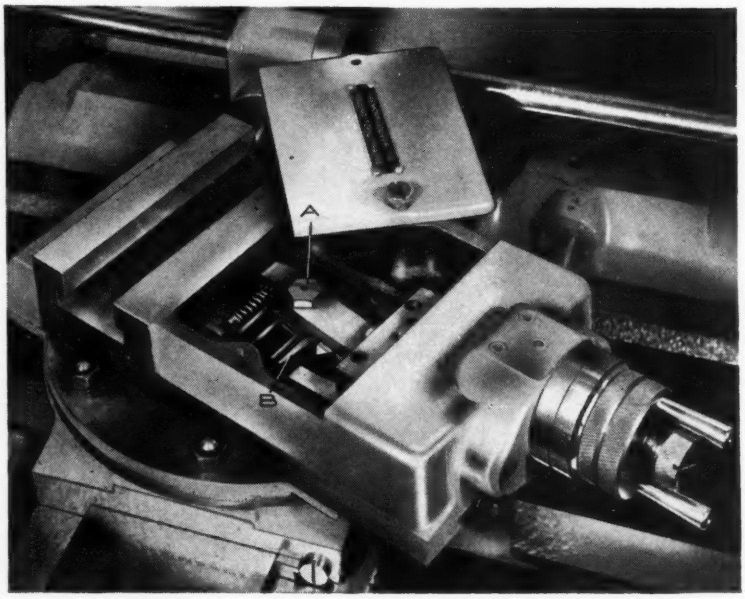


Fig. 5. (Left) Close-up View of Change-gear Housing of Universal Relieving Attachment with Cover Open to Permit Changing Gears. Fig. 6. (Right) View of Attachment with Cover Removed to Permit Cam Throw to be Changed

To obtain additional information on equipment described on this page, see lower part of page 240.

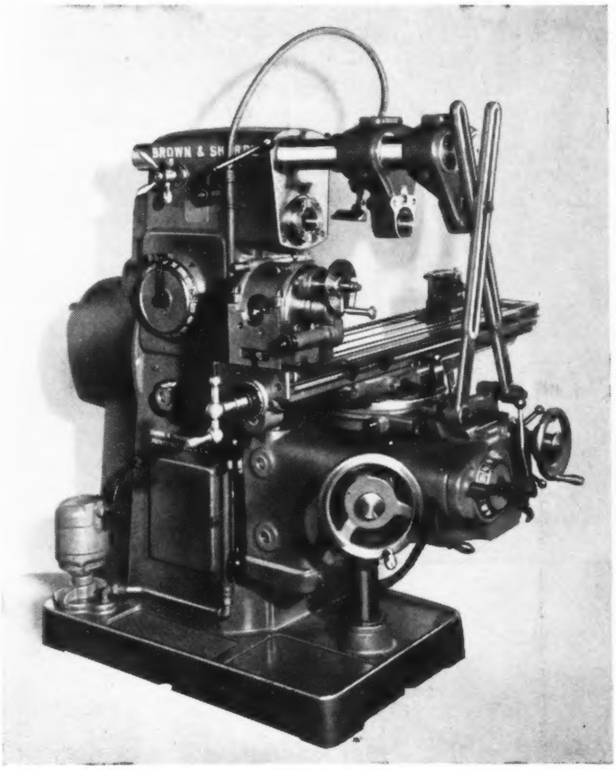


Fig. 1. Brown & Sharpe Universal Milling Machine with Extended Spindle Face

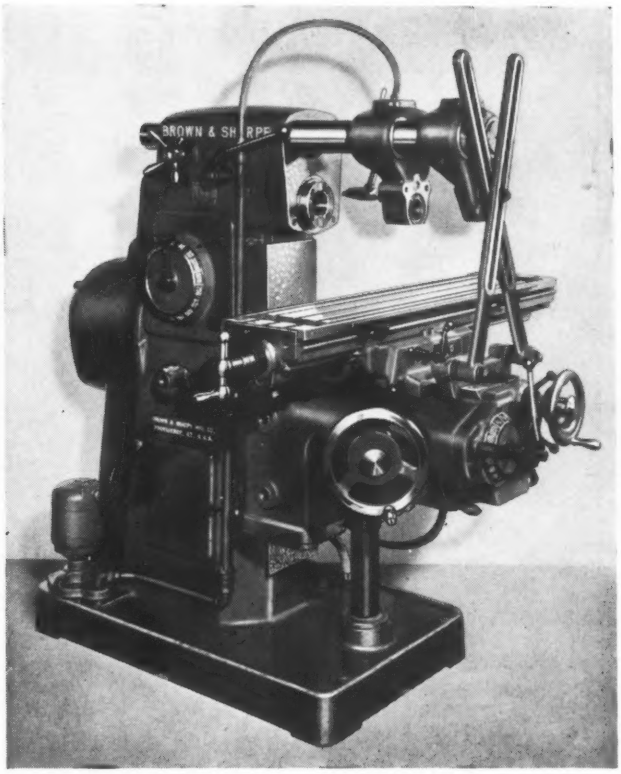


Fig. 2. Plain Type Brown & Sharpe Milling Machine with Extended Spindle Face

of exceptionally high abrasion resistance. These electrodes consist of steel tubes in which the hard surfacing alloy is contained in a concentrated form.

Tungweld-C is a tubular light-coated electrode which contains coarse particles of tungsten carbide within the tube. The particles are deposited by the arc in the weld crater, and as the weld metal solidifies, the particles are held in a tough iron-alloy matrix. The result is a weld deposit having superior abrasion resisting qualities. When the edge of the deposit is subjected to abrasive wear, the iron alloy and the base metal wear away, exposing tooth-like particles of tungsten carbide, thus producing a self-sharpening edge. This electrode is especially recommended for surfacing earth-cutting tools.

The Tungweld-F electrode is a shielded-arc tubular type containing fine particles of tungsten carbide, and is also intended for use on earth-cutting tools. It produces a smoother, thinner, and sharper edge than that produced by the Tungweld-C electrode. Both of the new electrodes are available in fourteen lengths in the 1/4 inch size. 62

Brown & Sharpe Milling Machines with Extended Spindle Face

The Brown & Sharpe Mfg. Co., Providence 1, R. I., has brought out a new No. 2 milling machine with an extended spindle face designed to give additional clearance for work and fixtures and to permit taking heavier cuts than is possible on regular type machines of lighter construction. The spindle nose of this machine, extending forward more than 3 inches from the conventional position, brings the front spindle bearing nearer the center of the table, thus reducing the over-arm and arbor lengths and giving the cutter a more rigid support. This design also permits the cutters to be mounted closer to the spindle nose, so that vibration and cutter wear are reduced. As a result of the extra-sturdy arbor support, it is often possible to use smaller arbors which will take smaller, less expensive cutters.

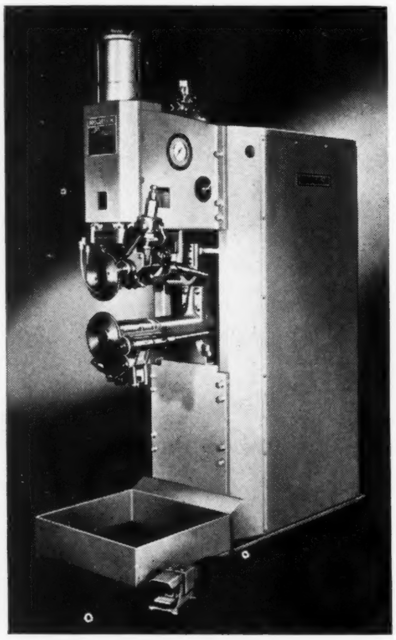
The new machine is built in a universal type, shown in Fig. 1, and in a plain type, illustrated in Fig. 2. Both types have a longitudinal feed of 28 inches, a transverse feed of 10 inches, and a vertical feed of 16 1/2 inches. The universal machine weighs approximately 4700 pounds, and the plain machine 4400 pounds.

The spindles of these machines have a No. 50 milling machine standard taper hole, and are provided with an all-geared drive from a 5-H.P. motor. The cutting feed and fast travel movements are also independently gear-driven by a 3/4-H.P. motor which is synchronized with the 5-H.P. spindle motor. A fast travel of 75 inches per minute is available with the spindle rotating or stopped.

Any one of eighteen spindle speeds ranging from 30 to 1200 R.P.M. can be selected by operating a single lever. A single lever is also used to select any one of eighteen cutting feeds ranging from 1/2 inch to 20 1/4 inches per minute.

The coolant system is operated by a 1/4-H.P. motor-driven centrifugal pump which automatically stops when the spindle rotation stops and can be disconnected by a switch when not required. Full automatic lubrication is provided for column, knee, table, saddle, and slides. 63

To obtain additional information on equipment described on this page, see lower part of page 240.



Roller-head Seam-welder

Progressive Roller-Head Seam-Welders

A line of roller-head seam-welders embodying many new features has been announced by the Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich. The line comprises three basic sizes designated light, medium, and heavy duty. Each size is available in three types. One type is adapted for circular welding, one for longitudinal welding, one for both circular and longitudinal welding.

Outstanding features of these welders include a head that is completely guided and aligned by four sets of anti-friction rollers which insure that the welding wheels will follow even extremely small deviations in material thickness and contour. This makes it possible to maintain constant weld pressures, and thus assures consistent, even weld characteristics.

The rollers are matched in pairs, adjustably pre-loaded, and guide the head the full length of its vertical travel, riding on V-guides on hardened and ground ways. The universal type welder can be quickly changed over from circular to longitudinal welding applications or vice versa, as the work requires.

An adjustable-retractable stroke is provided to insure minimum floor-to-floor time. These seam-welders can be used either for continuous, water- or gas-tight seam-welding or for roll-spot welding, and can be employed for cold-rolled steel, stainless or other alloy steels, aluminum and other non-ferrous alloys, and various types of coated metals. 64

LeMaire Automatic Multiple-Station Machines for Drilling, Reaming, and Counterboring Automotive Cylinder Blocks

The LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich., has recently built two automatic multiple-station machines for use in the V-8 engine production line of a leading automobile manufacturer. The seven-station ninety-four-spindle machine shown in Fig. 1 has four operating stations where holes are

Fig. 1. LeMaire Seven-station Machine Designed for Drilling, Reaming, Chamfering, and Counterboring the Bottom Face of V-8 Automotive-engine Cylinder Blocks

To obtain additional information on equipment described on this page, see lower part of page 240.

drilled, reamed, counterbored, and chamfered in the bottom surface of the cylinder block.

The seventy-four-spindle machine shown in Fig. 2 has two operating stations and is used for drilling, line-reaming, chamfering, and counterboring the holes in the ends and top surface of the cylinder block. Both machines are entirely automatic, and are designed for operation at high production rates.

As the work is carried from station to station on the machine shown in Fig. 1, it rides on spring-mounted guide blocks that hold it snugly against the hardened guide bars. When the block reaches the machining position, where it is properly located, it is locked against the guide bars. The entire cycle, including transfer, rough locating, final locating, clamping, drilling, unclamping, and withdrawal of the locators, is automatically performed after the block has been put in the loading position and the cycle button has been pressed by the machine operator. Production is approximately seventy-two pieces per hour at 100 per cent operating efficiency.

All units of the machine shown in Fig. 2 carry multiple-spindle drill heads with movable guide bushing plates mounted on two large guide bars. The cylinder blocks are carried through the machine from station to station on hardened steel rails by means of a hydraulically actuated traverse bar. This machine operates at a production rate of approximately sixty-three blocks per hour. 65

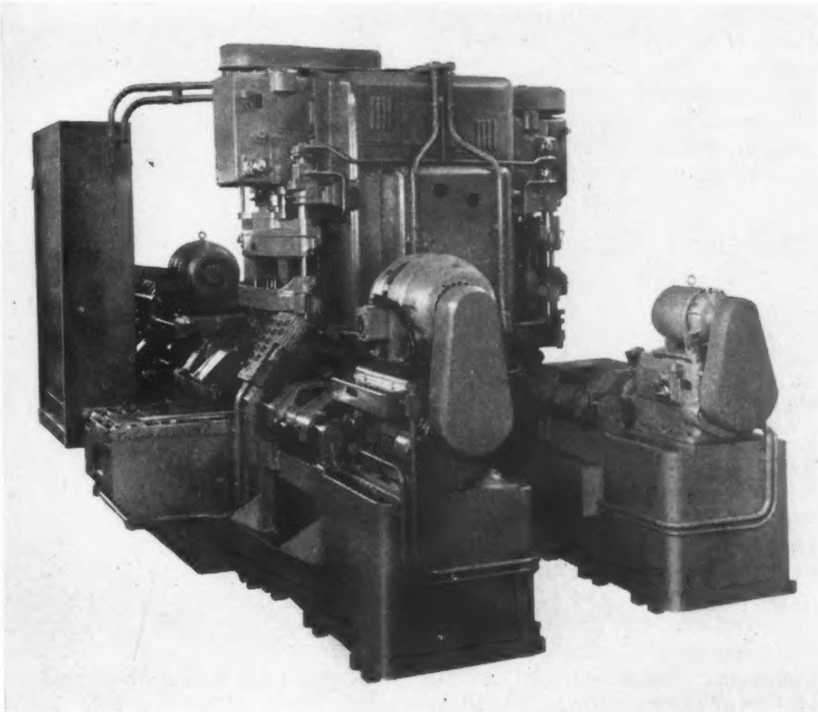
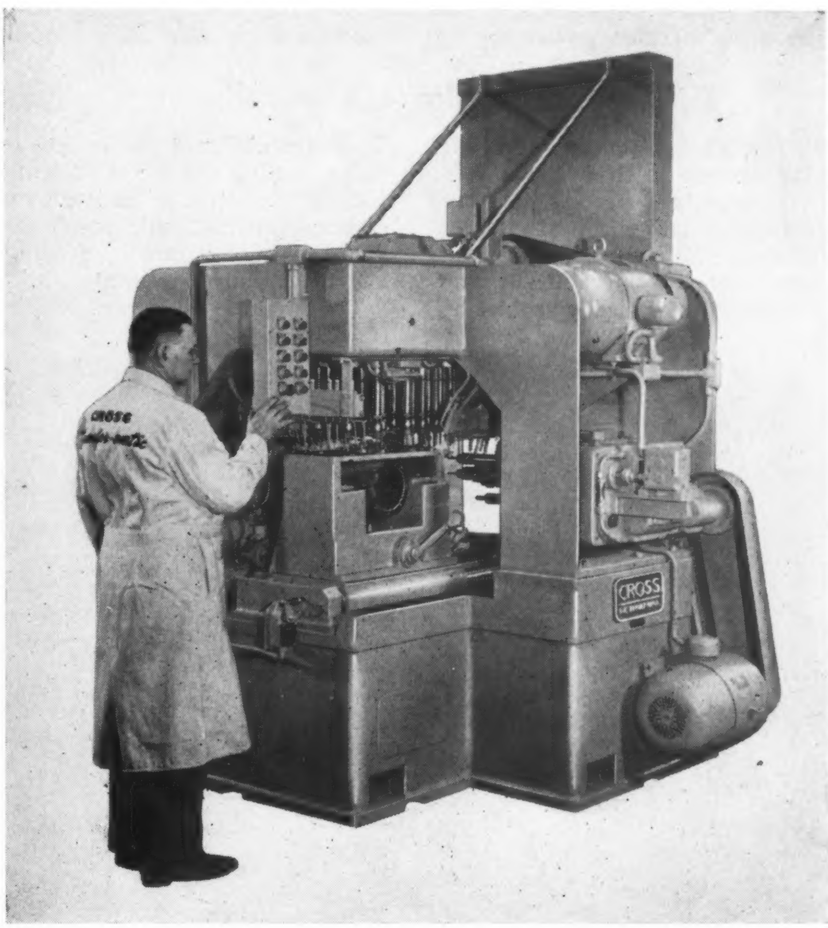


Fig. 2. LeMaire Five-station Seventy-four-spindle Machine Designed for Drilling Ends and Top Surface of V-8 Automotive-engine Cylinder Blocks

Cross Machine for Tapping Holes in Automatic Transmission Case

The Cross Company, Detroit 7, Mich., has developed a new machine that taps sixty holes in an automatic transmission case at the rate of sixty-five cases an hour. The work cycle is automatic. Simply pressing a button causes the machine to tap twenty-five holes at the first station, after which an automatic shuttle carries the part to the second station, where thirty-five additional holes are tapped. The part is then returned automatically to the first station for unloading.

Each tapping spindle is equipped

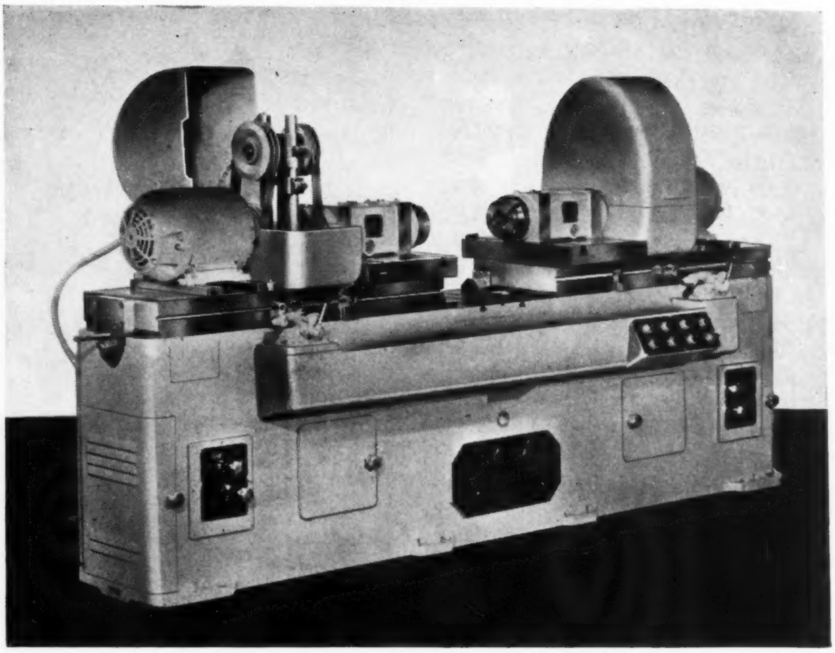


Machine for Tapping Automatic Transmission Cases Developed by The Cross Company

To obtain additional information on equipment described on this page, see lower part of page 240.

with an individual lead-screw feed; a safety device designed to eliminate tap breakage if holes have not been drilled in the previous operation; and a lubricating system that provides a measured amount of oil at each cycle.......66

Simplex Precision Boring Machine



Precision Boring Machine Built by Simplex Machine Tools Division of the Stokerunit Corporation

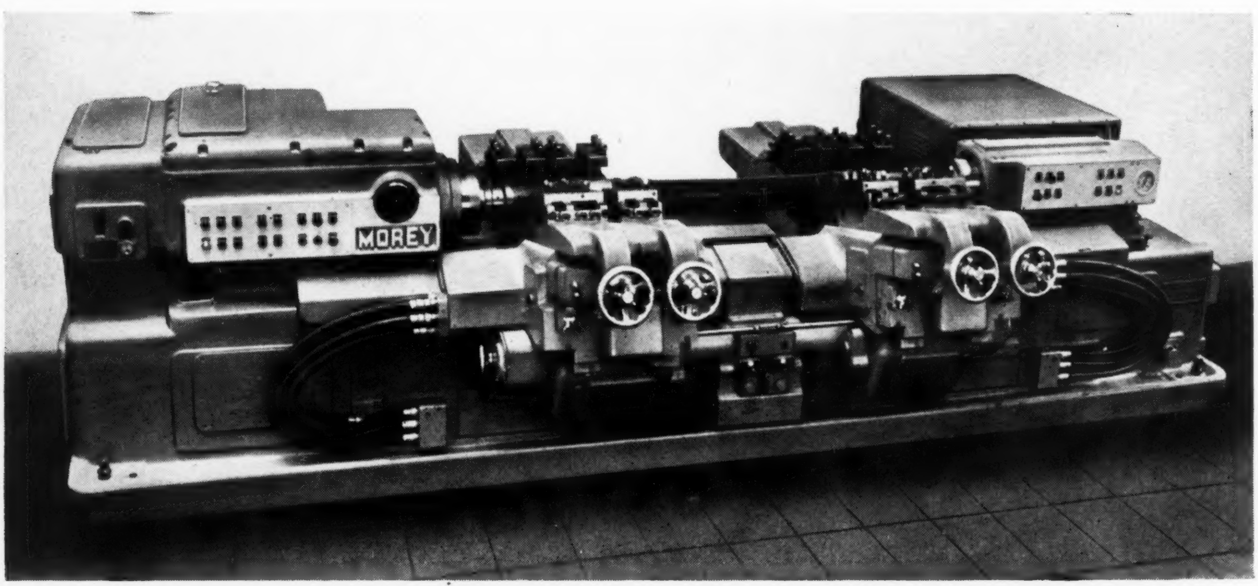
The Simplex Machine Tools Division, Stokerunit Corporation, 4526 W. Mitchell St., Milwaukee, Wis., has recently brought out a precision boring machine with a sealed lubrication system for the heads which prevents entrance of foreign matter and results in cooler operation. The bridges of this machine have been designed to permit greater use of multiple-head installations and many modifications in head mounting, thus increasing the all-around adaptability of the machine. The illustration shows the belt guard for the left head opened to illustrate the simplicity of the spindle-drive mechanism.

Unit type hydraulic systems which isolate vibration and heat from the machine proper are employed. All hydraulic piping is manifolded to facilitate the easy removal of the entire hydraulic system for cleaning and servicing operations. 67

Morey Railroad Axle Lathe

The Morey Machinery Co., Inc., 410 Broome St., New York, N. Y., has recently built six improved automatic lathes for use in machining railroad car axles. These new lathes are hydraulically operated and electrically controlled. They are designed for rough- or finish-turning the wheel seat and journal diameters of railroad car axles, using hydraulic power for all chucking, clamping, feeding, and traversing movements.

The machine illustrated weighs 58,000 pounds, and is designed with sufficient rigidity to permit using multiple tungsten-carbide tools at their maximum efficiency. The main spindle drive, including V-belts, clutch, gears, and anti-friction bearings, is designed to transmit 150 H.P. in continuous duty and to allow for momentary overloads up to 225 H.P. The complete machining cycle per axle requires between two and three minutes, depending on the size of the axle and the operation performed, the average production rate being



Automatic Lathe for Rough- and Finish-turning Railroad Car Axles, Built by Morey Machinery Co.

To obtain additional information on equipment described on this page, see lower part of page 240.

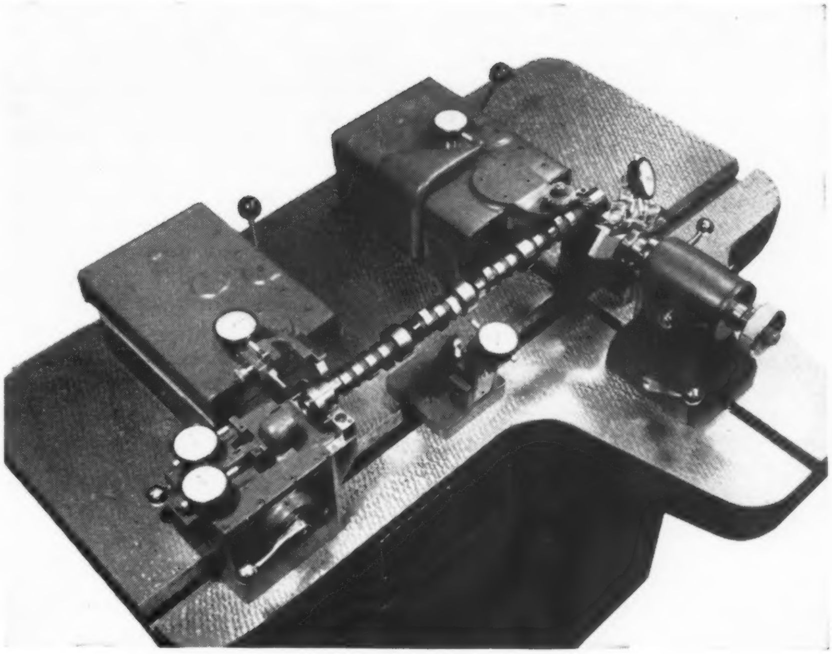
about 200 axles per eight-hour shift.

For finish-turning, the machine is equipped with an automatic roller steadyrest mounted on the rear carriages. The cycle control is duplicated on the headstock and tailstock ends. In addition to these two centralized control panels, individual controls are mounted directly on each unit to facilitate setting up the machine. An automatic chip conveyor takes care of 1000 pounds of chips per hour. ..68

Gear and Camshaft Checking Machine

The National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich., has announced a new Red Ring combination gear and camshaft checking machine. This machine will check automotive camshaft elements that must be held to close dimensional limits and such other elements of the camshaft as the oil pump and distributor drive gears, mounting flange and dowel-pin for timing gear, bearings, journals, and base circles of the cam lobes.

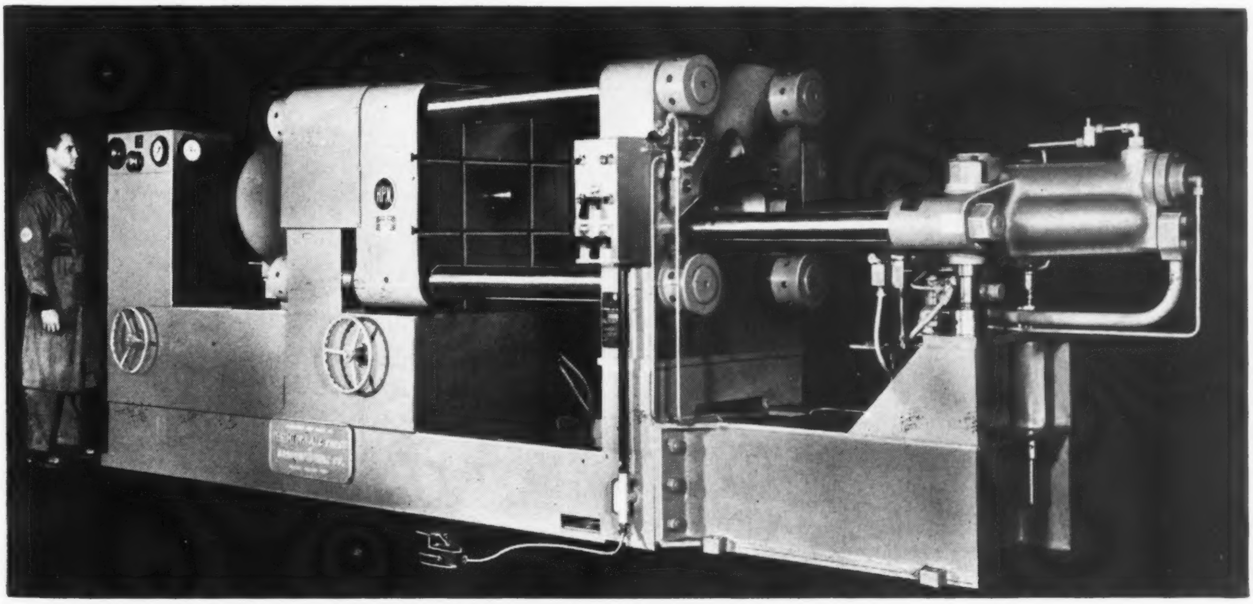
The distributor drive gear is tested for composite errors and eccentricity by rolling in mesh with a master gear. Tooth-to-tooth spacing is checked by one of the standard Red Ring gear checking heads. The timing gear mounting flange is tested for run-out on both faces, and the position of the dowel-pin in this flange is checked for its relationship to one of the cam lobes. One of the special heads is used for indicating run-out on the two center bearing journals and on the base circles of each of the cams. 69



Red Ring Gear and Camshaft Checking Machine

H-P-M Cold-Chamber Die-Casting Machine

The Hydraulic Press Mfg. Co., 1042 Marion Road, Mount Gilead, Ohio, has announced a new hydraulically operated self-contained cold-chamber die-casting machine designed to produce die-castings of aluminum, magnesium, and copper-base alloys. This machine is adapted for the mass production of aluminum castings weighing up to 10 pounds. It has a maximum die-clamping pressure capacity of 400 tons; die platens 38 by 38 inches in size; die space of 23 by 38 inches; clearance between rods of 23 by 23 inches;



Cold-chamber Metal Die-casting Machine Brought out by the Hydraulic Press Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 240.

daylight opening of 42 inches; ram travel of 16 inches; and a minimum shut height of 26 inches.

An intricate 5-pound aluminum casting of large area produced in an average 40-second cycle is a typical example of the work handled by this machine.

Some of the features incorporated in this new machine which were not available in the preceding model are: Clearance below die space mounting to accommodate core pulls attached to bottom of die; ample room for castings to drop from die directly onto a conveyor or into a quenching tank; adjustable vertical position of injection assembly; injection speed increased from 100 to 200 feet per minute without using additional motors; all electrical controls and timers, except operating switch panel, moved to end of machine, where they are protected from heat and molten metal; hydraulic power unit and reservoir for hydraulic-pressure medium mounted integral with machine base at one end of machine; new safety features, including electric and hydraulic interlock controls that prevent die clamp from accidentally closing due to electrical switch failure; and handwheels at front of machine, where they are readily accessible for adjusting die clamp and injection pressure.

The operator starts each cycle of the machine by turning the die-clamp actuating switch. After hand-ladling the molten metal into the injection chamber, the injection cycle is started by operating a foot switch. The balance of the cycle is automatic............70

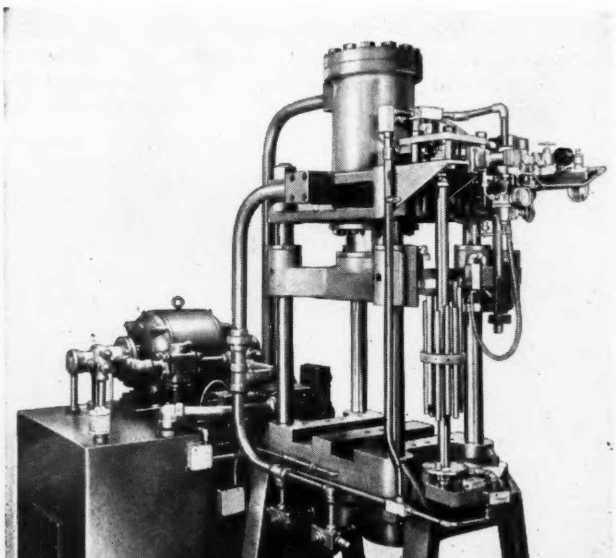
Elmes Tube-Bending Press

A hydraulic tube-bending press capable of an unusually large number and variety of set-ups has been announced by the Elmes Engineering Works of American Steel Foundries, 1002 Fulton St., Chicago 7, Ill. This bending press has a capacity of 20 tons, and can be set up for any number of sequences up to a maximum of twelve, with adjustable bending depth and automatic reset. This feature, together with a choice of four bending radii, gives users a selection of forty-eight possible bending variations for forming exhaust pipes, frames, furniture tubing, and similar work on a mass production basis. The operating cycle is controlled by a foot-treadle, conveniently placed as shown in the illustration...........71

M & N Compression Molding Press with Steam-Heated Platens

The M & N Machine Tool Works, Inc., 157 Orono St., Clifton, N. J., has brought out a compression molding press with steam-heated platens for plastics and rubber. This self-contained press, of all-steel construction, is manually operated with power-return ram for breaking open molds. The moving platen is guided on the four columns by babbitt bearings. The press is equipped with a platen having an upward pressure capacity of 200 tons and a downward pressure capacity of 30 tons. The ram is 13 inches in diameter and has a stroke of 12 inches. The height of the opening between platens is 12 inches, and the diameter of the platen columns 3 1/2 inches. A 3-H. P. motor serves to drive the dual pump of the hydraulic system.

The working pressure is 3000 pounds per square inch. The opening, left to right, is 20 inches, and front to rear 24 inches. The press is 7 feet high. A floor space of 37 by 60 inches is required. Multiple platens of smaller or larger sizes and electrically heated platens are supplied as optional equipment 72



Elmes Improved Tube-bending Press

M & N Plastics Molding Press

To obtain additional information on equipment described on this page, see lower part of page 240.

Onsrud Contour Milling Machine for Aluminum and Similar Non-Ferrous Metals

Round, rectangular, or irregular shaped parts up to 18 inches in diameter can be produced continuously on a rotary-table contour milling machine recently developed by the Onsrud Machine Works, Inc., 3940 Palmer St., Chicago 47, Ill. This milling machine is designed specifically for machining aluminum and all other non-ferrous metals having similar cutting characteristics.

Dual table construction permits one of the tables to be loaded while work is being milled on the other one. As each milling operation is completed, the operator presses a pedal, which automatically stops the rotating table, shifts the cutting tool to the newly loaded work, and starts the machining cycle for that part. Such parts as cast-aluminum waffle plates can be machined at high speed with this equipment.

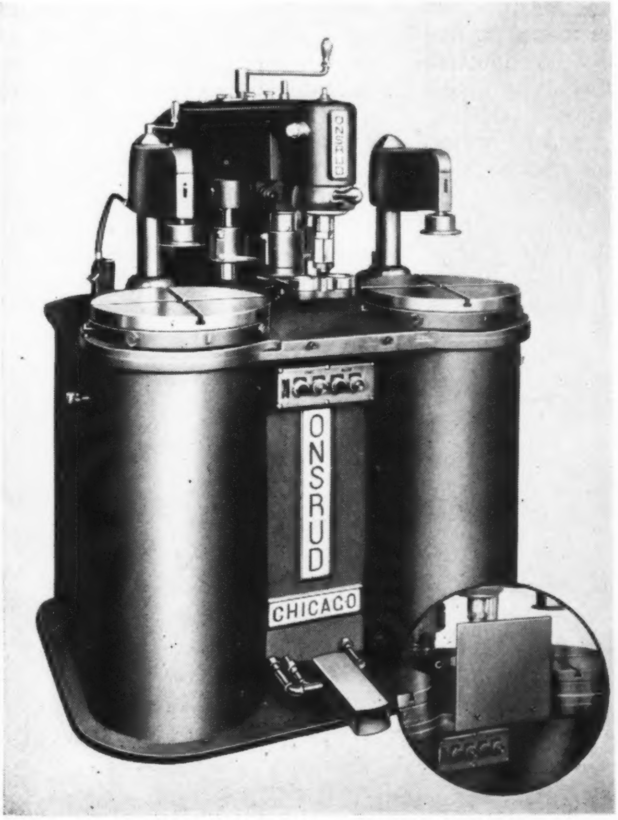
The work mounted on the table is rotated past the cutter in the cutter-head assembly, which consists of a high-speed belt-driven spindle, cutter, and guide roller, mounted on the front end of a rugged over-arm, which pivots toward the right- or left-hand table as required. The roller contacts the pattern under the work and guides the cutter, the guide roller being held in contact with the pattern by pneumatic pressure. Work is held in place on the tables by means of air clamps under a pressure of 700 pounds, assuming that the air-line pressure is 100 pounds per square inch.

The cutter-spindle is operated at a speed of 11,500 R.P.M. A wide range of table rotation speeds is available, and adjustments can be made while the machine is in operation. The work and operator are safeguarded by an air-line pressure switch adjusted to stop the machine motors should the air pressure for the work-clamps or tool-arm drop below 60 pounds per square inch. The lever controlling the table speed is protected by a safety lock to guard against accidental movement. ..73

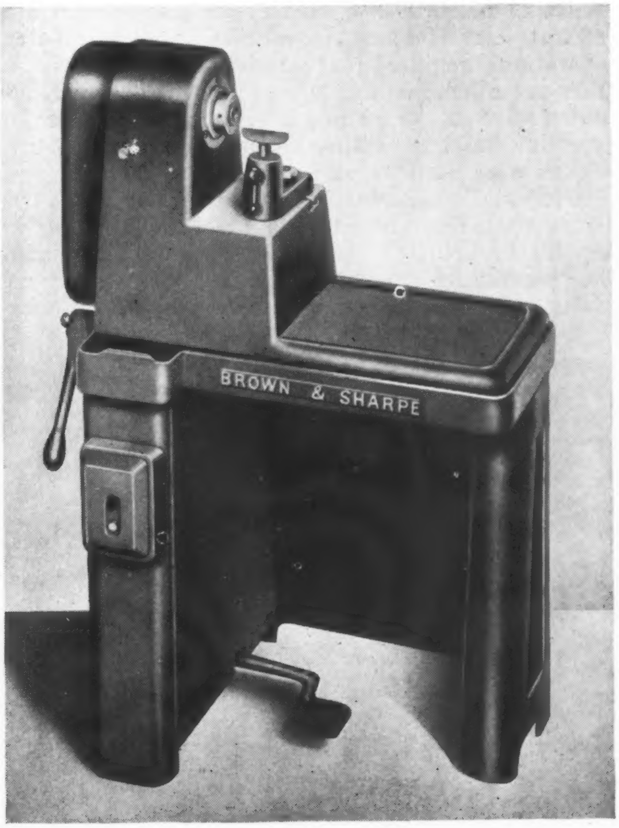
Brown & Sharpe Polishing and Finishing Machine

A machine designed for polishing, filing, burring, and similar operations on small parts has been added to the line of machine tools built by the Brown & Sharpe Mfg. Co., Providence 1, R. I. This machine can be furnished to take stock from 1/8 to 1 inch in diameter, and will swing work 9 3/4 inches in diameter over the bed and 7 3/4 inches in diameter over the tool-rest. It is particularly useful for hand tooling, polishing the heads of screws, and removing projections or burrs left by cutting-off or other tools employed on automatic screw machines.

Three spindle speeds of 4500, 3280, and 2380 R.P.M. are available through the V-belt drive from a 1/2-H.P. motor. Control of the collet and brake by foot-pedal provides for simultaneous opening of the collet and stopping of the spindle. This leaves both of the operator's hands free to load, unload, and perform the necessary operations. The outside of the work-spindle is threaded to take a small chuck or any other fixture



Onsrud Machine for Contour Milling of Aluminum and Similar Non-ferrous Metals

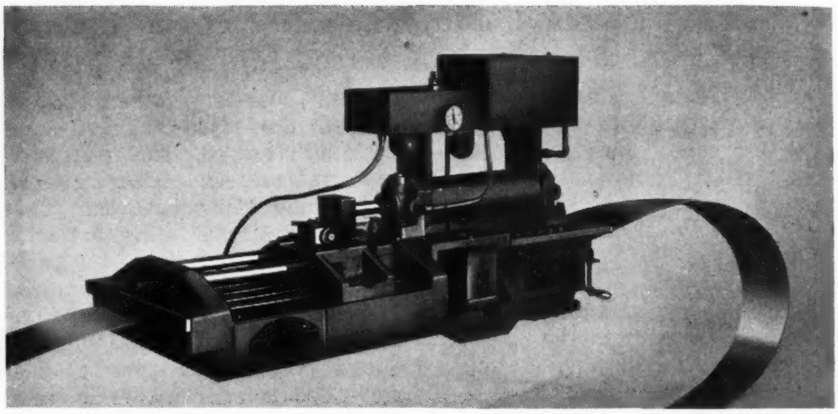


Polishing, Filing, and Burring Machine Brought out by the Brown & Sharpe Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 240.

that may be required. The machine can be conveniently operated from either a sitting or standing position. It occupies a floor space of 19 1/2 by 29 1/2 inches, and weighs about 340 pounds. 74

Air-Operated Slide Feed for Presses



Air-operated Self-contained Feed for Power Press Made by the U. S. Tool Company, Inc

A new air-operated slide feed which can be quickly changed from one press to another is announced by the U. S. Tool Company, Inc., Ampere (East Orange), N. J. This feed is a self-contained unit having no mechanical connections with the press. It can therefore be used with all types of sheet-metal fabricating machines and can be readily moved from one machine to another.

The air feed can be used semi-automatically or it can be made fully automatic by incorporating suitable interlocking switches. Practically unlimited feed lengths can be obtained by employing multiple strokes, the feed being timed to coincide with the stroke of the fabricating unit. Feeding accuracy can be controlled within 0.002 inch at each stroke.........75

Snyder Transfer Type Machine for Drilling Automotive Intake Manifolds

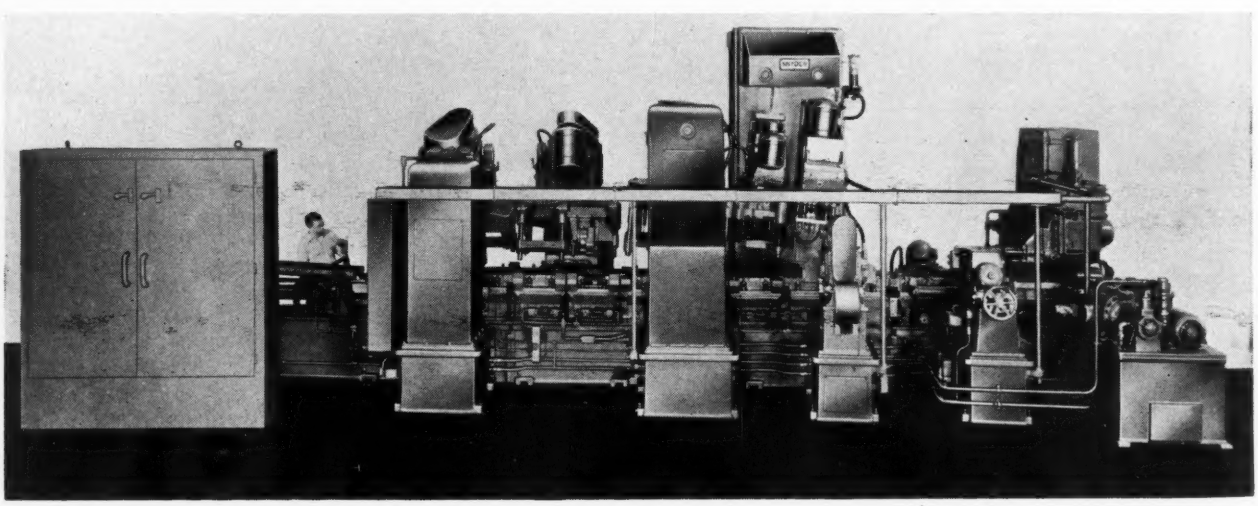
A new transfer type machine has been designed and built by the Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit, Mich., to perform in a work cycle of forty-eight seconds the various operations required to complete fifty-seven holes on the face of an automotive intake manifold. The machine has one loading station, eleven work stations, and one unloading station. Parts are indexed from station to station by a hydraulically actuated shuttle. The loading fixture, the eleven work fixtures, and the unloading fixture are mounted on the machine bed, which is made in five sections, cross-keyed and bolted together. The hydraulic piping and wiring is provided with junctions, so that the machine can be moved in five sections and readily reconnected.

The machine is equipped with six Snyder standard self-contained hydraulic units which carry multiple heads and bushing plates, two slide units, and one tapping unit with multiple-spindle head. In addition, three special slides are provided with multiple heads. These units, slides, and heads are mounted on risers and columns at various angles as required.

The machine requires a floor space of about 369 inches by 128 inches. Production is at the rate of sixty parts an hour. 76

Airco Silicon-Bronze Electrode

The Air Reduction Sales Co., 60 E. 42nd St., New York 17, N.Y., has announced a new silicon-bronze electrode that can be used for the welding of silicon-bronze base metal and copper, as well as for joining galvanized iron and silicon-bronze to steel. This electrode is intended for application in the manufacture of chemical and food processing equipment, sewer disposal equipment, and hot-water tanks. Advantages claimed for the new electrode include soft spray type shielded-arc action; low spatter loss; exceptionally



Transfer Type Machine Built by the Snyder Tool & Engineering Co. for Drilling Automotive Intake Manifolds

To obtain additional information on equipment described on this page, see lower part of page 240.

free-flowing, dense deposits; easy slag removal; crack-free welds; unusually smooth deposits; all-position welding; and ability to weld dissimilar metals. It is available in five diameters, ranging from 3/32 to 1/4 inch, and in lengths from 11 to 18 inches....77

Jones & Lamson Carbide-Tipped Die Chasers with Ground Thread Forms

Carbide-tipped Die Chasers with Ground Thread Forms Developed by Jones & Lamson Machine Co.

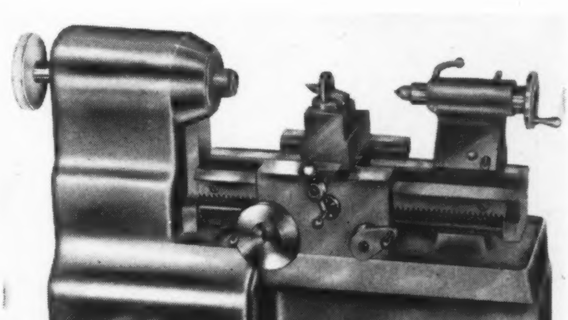
The Jones & Lamson Machine Co., Department 710, Springfield, Vt., has announced the development of carbide-tipped die chasers with ground thread forms for selected applications on turret lathes, automatics, and threading machines. In one application, a 3/4-10 NC thread is being cut on an S A E X1315 steel stud in a turret lathe with a tangent die-head equipped with the new carbide-tipped chasers in one-third of a second at a speed of 2000 R.P.M. or 4000 surface feet per minute. A high quality finish with a Class 3 tolerance is obtained. The carbide chasers make it possible to machine this stud complete with the spindle revolving at 2000 R.P.M. for the entire sequence of cuts, thus eliminating the need for shifting to a lower speed for the threading operation.

Besides the advantages of increased threading speeds, these chasers also have greatly lengthened life. The carbide-tipped chasers are effective in threading steel and still more efficient in threading hard rubber, fiber, and abrasive materials that have a rapid dulling effect on ordinary chasers 78

Jewelers' Size "DuoLathe" Adapted for Tool-Room and Instrument Work

A new metal-turning lathe designated the "DuoLathe," which is designed to combine the regular facilities of a miniature standard lathe with the highly specialized features of a jewelers' lathe, has just been announced by Small Machines, Inc., 2010 S. Sepulveda Blvd., West Los Angeles 25, Calif. This lathe has a swing of 3 inches, a distance between centers of 3 1/2 inches, and a spindle speed range of 100 to 3000 R.P.M. It is 10 1/2 inches long, 7 1/4 inches high, and 3 3/4 inches deep, and weighs 12 pounds. The high-speed universal motor mounted in the base has a foot-operated rheostat control and can be operated on alternating or direct current.

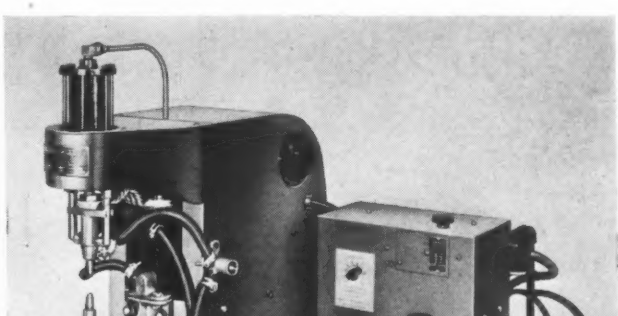
This lathe is suited for use in machine shops, tool-rooms and laboratories, as well as for watchmakers' and jewelers' work. It is also adapted for use in instrument, radio, photographic, and dental manufacturing and repair work. The hardened and ground ball bearing spindle has a 5/16-inch through hole which will take 1/4-inch stock and will accommodate standard jewelers' chucks..79



"DuoLathe" Designed to Combine Features of a Jewelers' Lathe with Those of a Standard Miniature Precision Lathe

Bench Type Welder

Weldex, Inc., Department K, 7308 McDonald Ave., Detroit 10, Mich., has introduced a new fully automatic 7 1/2-KVA bench type spot-welder designed for the rapid joining of small metal parts. This machine will weld light non-ferrous metals of the same or dissimilar alloys and thicknesses on a high-speed production basis, and will also give efficient low-cost operation on ferrous metals up to the equivalent of two thicknesses of 14-gage cold-rolled steel.



Bench Type Spot-welder Brought out by Weldex, Inc., for the Rapid and Economical Joining of Small Metal Parts

To obtain additional information on equipment described on this page, see lower part of page 240.

DEVELOPED TO SAVE YOU MONEY

THE NEW No. 5 CUTTER AND TOOL GRINDING MACHINE

UNIQUE FEATURES

- √ **Double-ended ball bearing wheel spindle (super-precision, permanently-sealed, grease-lubricated bearings).**
- √ **Ingenious, roller-bearing table.**
- √ **4-location table crank or knob.**
- √ **Hollow, one-piece base, mounted on 3 points to preserve alignment.**
- √ **Additional equipment: Indexing equipment; Raising Blocks; Formed Cutter Sharpening Equipment; Collets for No. 5 & No. 7 B & S Taper Shanks; Draw-in Bolt; 3/8" and 3/4" Cutter Bars.**

Rear view shows simplicity and sturdiness of machine.

Centers swing 6⅜" in diameter. Distance, center line of work to center of wheel spindle, greatest 8⅛", least, 1⅝". Distance, center of wheel spindle to top of table, greatest, 6⅞"; least, 1⅜". Write for complete specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BROWN &

In addition to the air strainer, regulator, gage, and lubricator, standard equipment includes a built-in four-step transformer tap-changing switch; single-acting air cylinder; magnetic long-life contactor; and electronic timer. The machine is regularly furnished for 220-volt, 60-cycle single-phase alternating-current operation, but is also available for operation on 380 or 440 volts. Standard throat depth is 4 1/2 inches..................80

(Foreground) View Showing Condition of Carboloy-tipped Teeth of a Face Milling Cutter after Taking Eight Cuts without Using Flywheel. (Background) View Showing Cutter after Taking Ninety-two Cuts when Using Lovejoy "Fngineered Flywheel"

Flywheels for Milling Machine Spindles

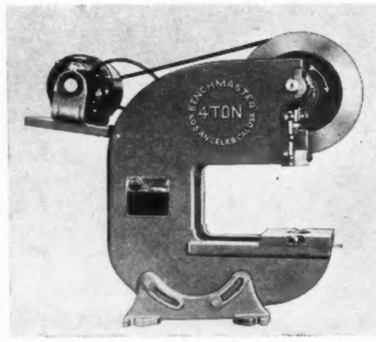
The Lovejoy Tool Co., Inc., Springfield, Vt., has announced that it now has available three styles of "engineered flywheels" for milling machine spindles. These flywheels are made in diameters ranging from 12 to 18 inches. They are precision-machined from heat-treated alloy forgings to fit National Standard spindles.

These flywheels are mounted on the front ends of the milling spindles close to the cutters, and store up energy for use when most needed to carry the cutters over the work-piece. Vibration injurious to gears, spindle, and bearings is thus reduced. Great increases in tool life on certain milling operations, less cutter sharpening, and improved finish are advantages said to result from the use of these flywheels. 81

Benchmaster Deep-Throat Punch Press

Benchmaster Mfg. Co., Los Angeles, Calif., has announced a new deep-throat punch press of 4 tons capacity with a throat of sufficient depth to permit punching at the center of a 17 1/2-inch circle. Adequate power is furnished for most jobs by a 1/3-H.P. motor. The press can be used either with or without the 6- by 8- by 1-inch bolster plate.

It is regularly supplied with either a 1-inch or a 1 1/4-inch stroke, although strokes up to 2 inches can be obtained on special order. The ram position is adjustable, and dovetails are gibbed for take-up if wear occurs. All bearings have bronze bushings.



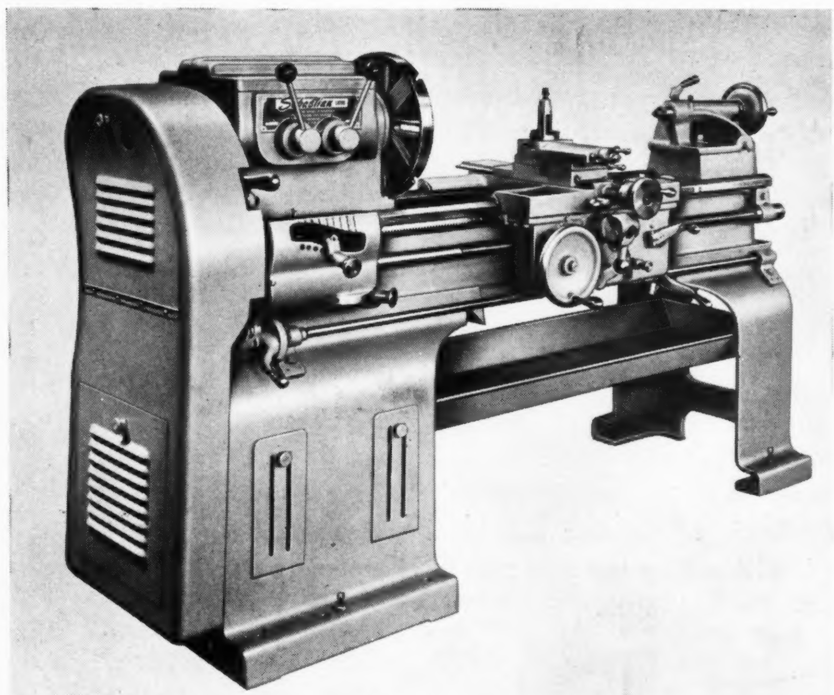
Deep-throat Punch Press Built by Benchmaster Mfg. Co.

A positive single-trip, safety mechanism is employed to engage the flywheel. The press can be supplied either in a bench or a pedestal model with inclinable frame 82

Sebastian Lathes Made by King Machine Tool Division of American Steel Foundries

The King Machine Tool Division, American Steel Foundries, Cincinnati 29, Ohio, is now manufacturing Sebastian lathes, in addition to its line of vertical boring and turning machines. The new King-made Sebastian lathes are available in a variety of types and sizes, including general-purpose, clutch-and-brake, and line-shaft drive types in 12-, 16-, and 20-inch sizes. Gap and metric screw types are made in 16- and 20-inch sizes. All lathes in this line are equipped with an eight-speed geared head.

Among the principal features of the Sebastian lathes are Timken tapered roller bearings on all shafts in the headstock; apron control for start, stop, and reverse of spindle; knob control handle



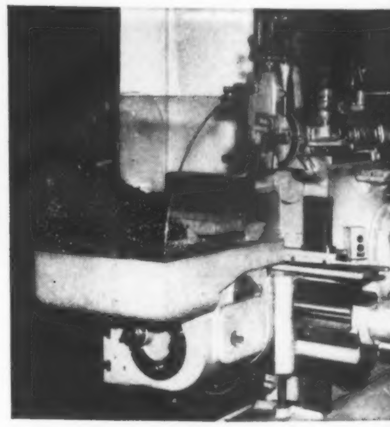
Sebastian 16-inch Lathe Built by the King Machine Tool Division, American Steel Foundries

To obtain additional information on equipment described on this page, see lower part of page 240.

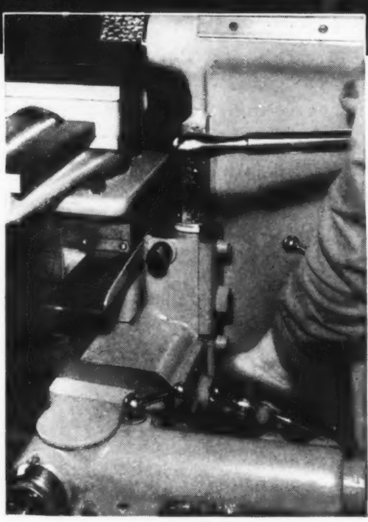
Power down feed speeds vertical facing and slotting.

Auxiliary front cross feed is very helpful for developing contours.

The Cincinnati automatic tool lifter is essential for carbide tools and high speeds.



Supplementary table top for extra large clamping space



Power elevation to the rail, with all controls convenient to the operator, reduces setup time.

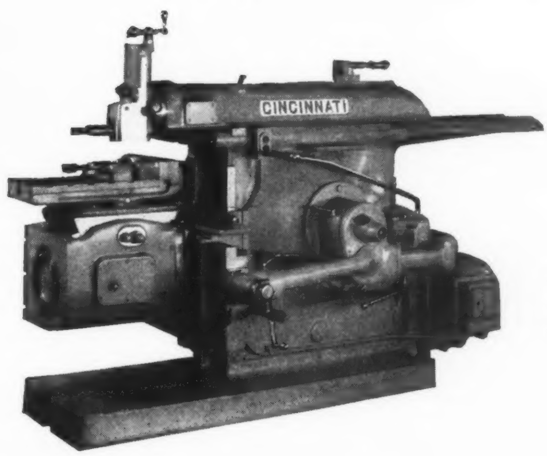
FAST SHAPING

...and wide utility, too!

Powerful Cincinnati Shapers are tailored to your needs—the many features available to you will both speed your job and widen the use of a shaper in your shop.

Cincinnati Shapers are accurate, speedy and versatile. They are the handy man of industry.

Write for Catalog N-3, describing the many features and many types of Cincinnati Shapers available to you.



A Cincinnati Shaper with universal table is especially useful for tool room and die work.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

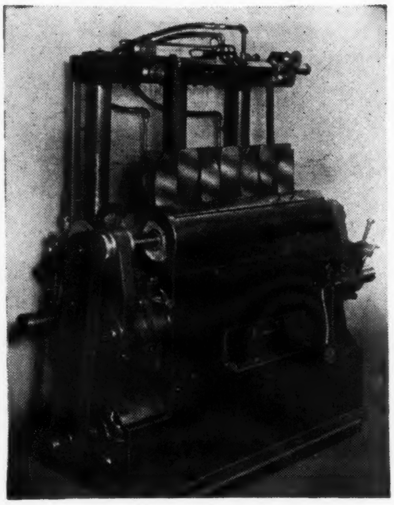
SHAPERS · SHEARS · BRAKES

for apron friction feed; fifty-seven feed and thread changes; and accuracy of 0.0005 inch at all alignment points. Equipment includes a steadyrest, a threading dial, and two faceplates. 83

Hydraulic Polishing and Glazing Machine

The Central Machine Works, Inc., Worcester 8, Mass., has brought out a hydraulic polishing machine designed to produce a mirror or glazed finish on flat or nearly flat surfaces of such products as flat-iron bases, hacksaw frames, skates, and machetes.

The work is mounted on a magnetic or non-magnetic holder having a vertical working stroke, the speed or length of which can be changed instantly. The work is allowed to drop between two buffing wheels in a guarded chamber. The pressure of the wheels is adjusted automatically to suit the work. Provision is made for loading the work from the front or either end of the machine. 84



Polishing Machine Built by the Central Machine Works, Inc.

Cold Nut-Forming Machine

A cold nut-forming machine capable of producing a large variety of hexagonal nut blanks is being manufactured by the National Machinery Co., Tiffin, Ohio. Standard single- and double-chamfered nuts, washer-faced nuts, castellated nuts, Marsden lock-nuts, and jam nuts can be produced on this machine.

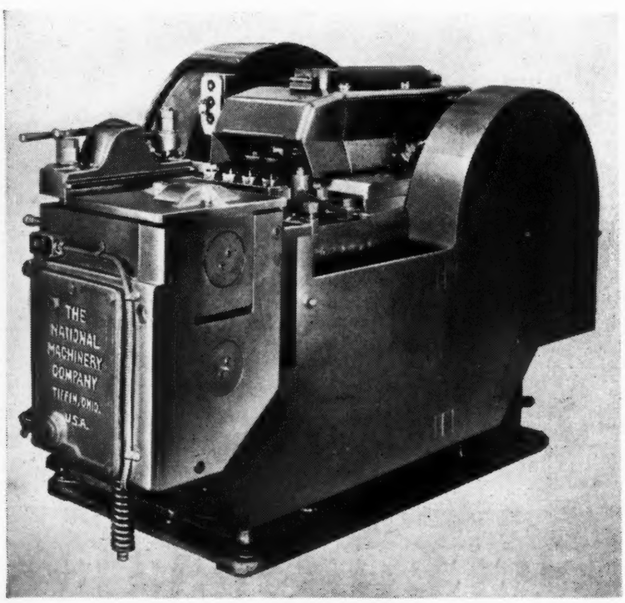
Features of the machine include patented over-arm heading slide; automatic lubrication; and a four-station transfer mechanism which turns the nut blanks 180 degrees after each stroke. All operations—gathering, blanking, forming and punching—are carried on simultaneously, a complete nut being produced at each stroke. Scrap loss is held to between 10 and 15 per cent. The machine is built in six sizes, ranging from 5/16 to 1 inch. Outputs range from 100 nuts a minute on the 5/16-inch size to 40 a minute on the 1-inch size. 85

L & N Control for Aluminum Melting Furnaces

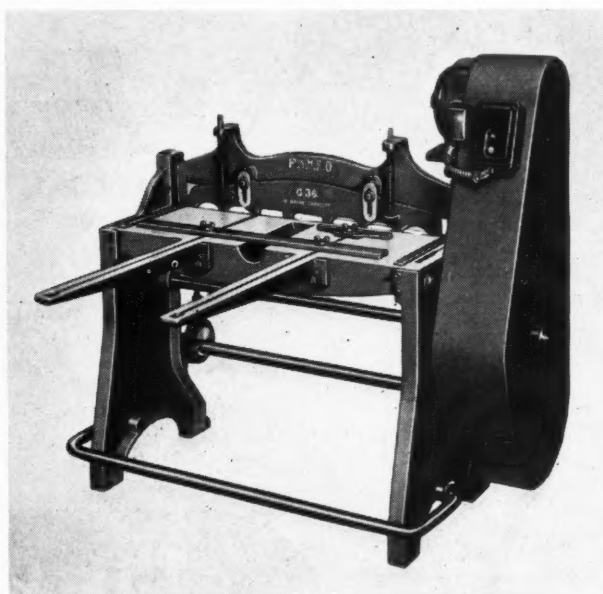
Batch type furnaces for melting aluminum can be brought to the required temperature quickly and accurately by means of recently modified duration-adjusting type electric controls announced by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa. This equipment has been developed to improve the quality of castings by preventing gas inclusions and blow-holes through limiting high-temperature variations. By bringing the melt to the correct superheat for pouring, the equipment also provides better control of shrinkage and closer tolerances for castings. 86

Famco Power Shears

A line of power squaring shears designed to satisfy the demand for a light-weight, low-cost, power-operated machine has been brought out by the Famco Machine Co., 1300 Racine St., Racine, Wis. These presses are capable of cutting 18-gage stock easily and rapidly. Three models with capacities of 36, 42, and 52 inches are available. Their respective shipping weights, equipped with motor, are 1050, 1200, and 1400 pounds.....87



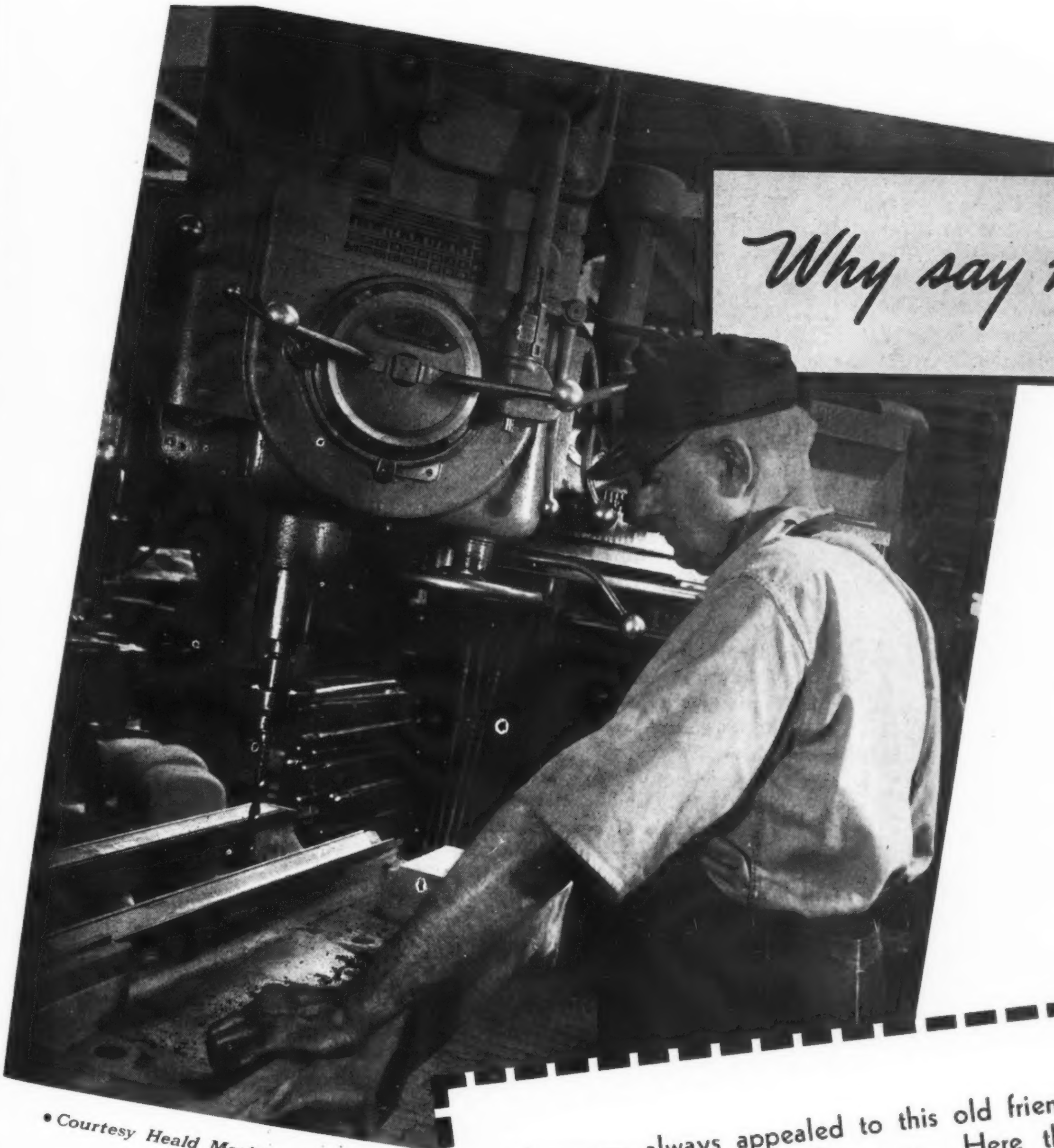
Cold Nut-forming Machine Manufactured by the National Machinery Co.



Power-driven Squaring Shears Brought out by the Famco Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 240.

Why say more?



• Courtesy Heald Machine Tool Company

Accuracy always appealed to this old friend—The Heald Machine Tool Company. Here they are boring, facing and reaming numerous holes in a 1360-lb. casting.

They say, and we quote: "We bought this Cincinnati Bickford Super-Service Radial Drill to increase war-time production. We also have ten large and a flock of smaller ones. Why say more?"

Cincinnati Bickford Super-Service Radial Drills are always accurate, dependable tools, highly productive and profitable in the shop.

Write for Bulletin R-24A.

See our condensed Catalog in Sweet's File.

RADIAL AND UPRIGHT — SUPER C.B. SERVICE — DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9. Ohio U.S.A.**

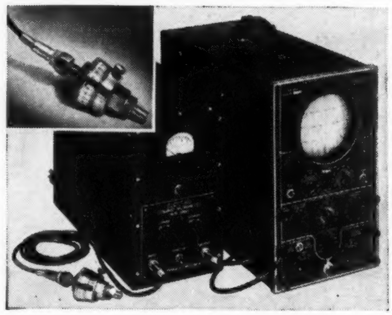
Light-Weight Hand-Held Welding Shield

This light-weight, hand type, seamless welding shield has been brought out by the American Optical Co., Southbridge, Mass., for use where a welding helmet is impractical and for tack-welding and set-up work. The steel welding-glass holder of the shield is insulated and rivetless. The fiber handle is 5 1/2 inches long and is securely riveted to the body. Without glass the entire shield weighs only

11 ounces. It is available with standard "Noviweld" or "Filterweld" glass plates for protecting the eyes against welding hazards...............88

Electro Dynamic Micrometer

Device designed for use with the Du Mont Model 208 oscillograph which will measure movement, radial displacement, or vibration of any part made of ferrous material. This dynamic micrometer does not touch the moving part, and therefore, does not interfere with its movement. The displacement is easily read in ten-thousandths of an inch with an accuracy comparable to that obtained with a standard micrometer. Readings are made on a conventional micrometer sleeve about 2 inches in diameter, which is directly calibrated in thousandths and ten-thousandths of an inch. The dynamic micrometer functions independently of acceleration or the frequency of displacement. The accuracy of the dynamic micrometer is the same for a static condition as for a dynamic condition corresponding to speeds up to 200,000 R.P.M. The device is 12 1/8 by

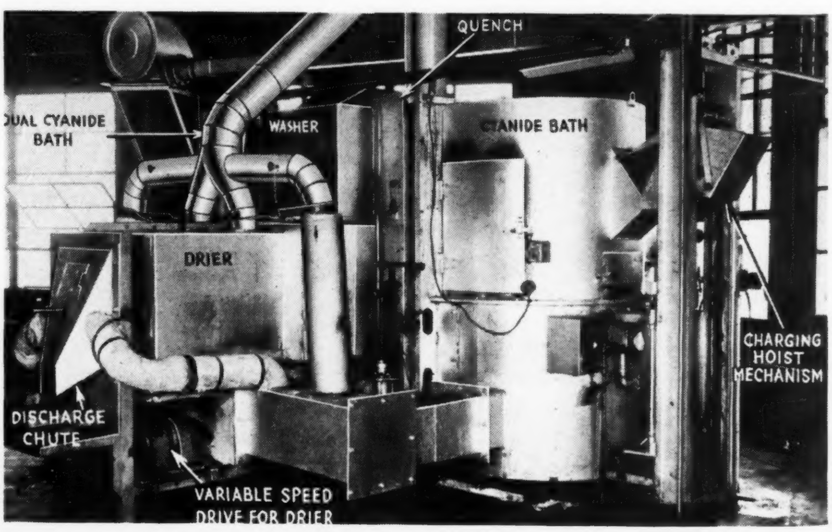


7 1/16 by 18 1/2 inches in size, and weighs 27 pounds. Placed on the market by the Electro Products Laboratories, 549 W. Randolph St., Chicago 6, Ill....................89

Dempsey Continuous Salt-Bath Unit

Dempsey Industrial Furnace Corporation, Department B, 133 Main St., Springfield, Mass., has brought out a new continuous salt-bath heat-treating unit, all members of which are enclosed to provide safe, cool, and clean working conditions. All fumes are carried off by stacks, thus eliminating the hazards of cyanide hardening. The unit can be used with neutral or cyanide type salts and is especially suited for hardening small parts such as screws, bolts, or other small screw machine parts.

The complete unit consists of two pot type furnaces, a quench unit, a wash unit, and a dryer. Automatic handling equipment, loads the charge into the salt baths, transfers the work through the quench, wash, and dryer units, and delivers it into a transfer box. Charges range from 100 to 125 pounds, and salt bath temperatures and heating cycles can be varied for each batch. These furnaces can be designed to use any fuel—oil, gas, or electricity—and are built in capacities of 300 to 500 pounds per hour of finished work when cyanide-hardening screws to a case depth of approximately 0.003 inch.........90

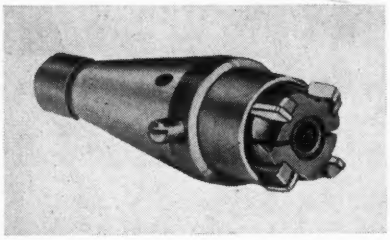


Cooley Electric Box Furnace

Electric box furnace with simplified vertical-lift door having exterior counterweights and operating mechanism. Designed to provide accu-

rately controlled temperatures from 2000 degrees F. to as low as 300 degrees F., covering requirements for hardening and other high-temperature work, as well as low-temperature applications, such as tempering or drawing of steels and non-ferrous heat-treating. The heating chamber is 8 by 6 by 14 inches. The power capacity is 4650 watts. Built by Cooley Electric Mfg. Corporation, 38 S. Shelby St., Indianapolis, Ind....91

To obtain additional information on equipment described on this page, see lower part of page 240.

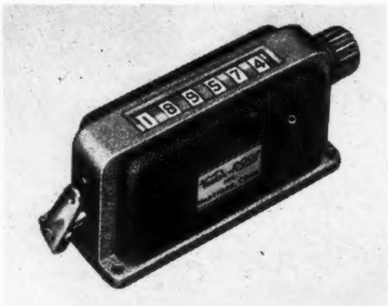


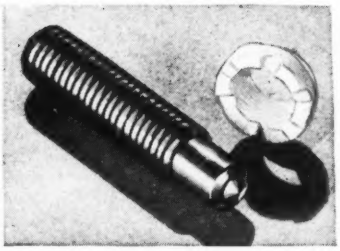
Howald Carbide End-Mills with Replaceable Blades

Carbide end-mill with replaceable blades, recently added to the line of carbide end, face, and shell milling cutters made by the W. T. Howald Machine Works, 182 Sigourney St., Brooklyn 31, N. Y. These new end-mills are especially designed for production milling. Made in diameters of 1 1/2, 2, and 3 inches, and have, as an integral part, No. 40 NMTB, Weldon, or Brown & Sharpe No. 9 shanks. The replaceable carbide-tipped blades are made of standard square stock without serrations. The "Cone Blade" lock permits rapid adjustment to within a few thousandths inch, minimizing cutter grinding and reducing set-up time............92

Veeder-Root Reset Type General-Purpose Counter

Mechanically operated reset type counter adaptable to any standard drive from either side, with easy-reading line of six black figures. This counter is made in four types for ratchet, rotary ratchet, direct drive, or revolution counting at operating speeds of 1000 to 5000 counts per minute, depending on the type of drive. It is especially designed to facilitate built-in installation. The dimensions are 4 1/2 inches long, 1 9/16 inches high, and 1 1/4 inches wide. Manufactured by Veeder-Root, Inc., Hartford 2, Conn. ...93



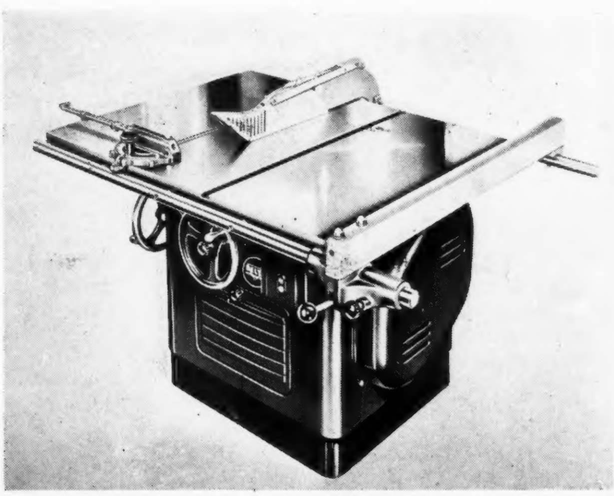


Arc-Welding Studs

Arc-welding stud and arc shield manufactured by KSM Products, Inc., 6512 Park Ave., Merchantville, N. J. Designed to shield and control the arc in such a manner as to permit the escape of gases formed at the site of the weld and confine the molten metal, so that a compact fillet of minimum diameter is formed at the base of the stud. Studs are regularly available from stock in sizes ranging from 1/4 inch–20, with lengths of 3/4 inch to 3 inches, up to and including 1/2-inch–13, with lengths from 1 inch to 3 1/2 inches. This line includes special studs without threads, large-sized studs, collar studs, welding pads, headed studs, and studs with S A E threads.........94

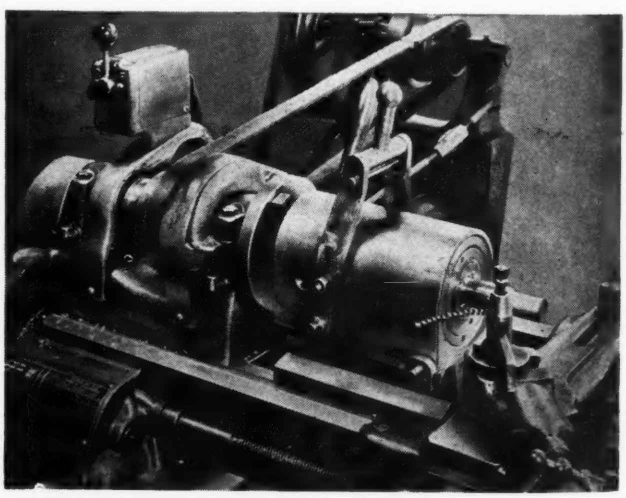
Delta Tilting Arbor Saw

A tilting arbor saw with a 12-inch blade that can be operated at speeds of 1800, 2400, 2600 R.P.M. or higher, and which has a finish-ground table 38 by 48 inches, has been brought out by the Delta Mfg. Division, Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis. This saw can be used for cutting aluminum, carbon, and other similar materials which are difficult or impossible to handle on an ordinary saw. It is capable of cutting through 4 1/8-inch wood stock on a square cut and of splitting a 4-foot panel into two 24-inch parallel sections. The saw will also do straight ripping, cut-off work, miter cutting, rabbeting, grooving, and similar work. It can be used with either a 3- or 5-H.P. motor. The 12-inch blade can be tilted to the right 45 degrees, in which position it will cut stock 2 7/8 inches thick............95



Zagar Collet Speed Chuck

New type of collet speed chuck designed to rotate on its own bearings, brought out by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. Features claimed for this chuck include increased holding capacity, maintenance of extremely high degree of accuracy, and the elimination of overhang and chatter. The chuck rotates on a precision ball bearing and the turning power is obtained from the spindle of the machine to which it is attached. The stand rd Zagar principle of having the collet remain stationary while it is being opened and closed makes it possible to maintain accurate length dimensions on the parts being machined. Designed in 1- and 2-inch through capacities, and made to order for application to any type of lathe, grinding machine, or other rotating-spindle type machine...............96



To obtain additional information on equipment described on this page, see lower part of page 240.

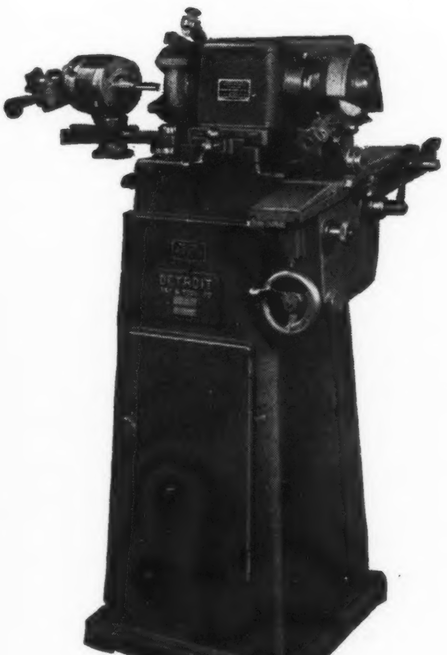
This ... is the business end—

TAKE CARE OF IT

ON A

DETROIT

TAP RECONDITIONER



You can put worn taps right back in "good as new" shape with the DETROIT 4 in 1 tap reconditioner. It's like getting an almost unlimited supply of NEW TAPS for next to nothing, for this reconditioner is remarkably low in price—pays for itself in short order. It chamfers, grinds flutes (from 2 to 6), spiral points taps where required and polishes the points. Handles taps up to 1½ inch diameter.

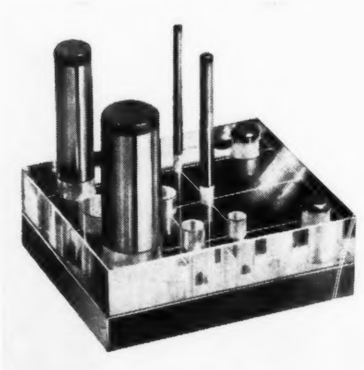
For complete information write or wire for Bulletin #DTR-4.

DETROIT TAP & TOOL CO.
8432 BUTLER AVE. • DETROIT 11, MICHIGAN

The Home of "M-11" CHROME-COBALT HSS TAPS, THREAD MILLING CUTTERS & THREAD GAGES

Shim-Stock Punch and Die Set

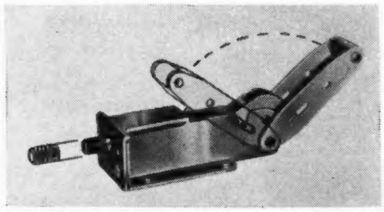
Punch and die set designed primarily for cutting holes in steel or brass shim stock from 0.002 to 0.025 inch thick, but which can also be used for punching holes in paper, cardboard, gasket paper, rubber, fiber board, plastic shim stock, and similar materials. The material to be punched is placed between the transparent plastic top and the hardened steel base of the die set. By looking through the plastic top, it is a simple matter to align the hole or scribed lay-out on the work with center lines



on the under side of the plastic top. The proper size punch is then inserted and tapped with a hammer to blank out the hole. Washers can be readily punched out by using two punches of the required sizes. The die is 1 1/4 by 3 by 3 1/2 inches in size, and provides for cutting nine standard size holes ranging from 1/8 to 3/4 inch in diameter. Distributed by the M & M Co., 426 N. Third St., Saginaw, Mich. 97

Knu-Vise Push-and-Pull Clamp

Knu-Vise push-and-pull clamp designed for application where space is limited. It is adapted for use where the plunger must travel under load, either pushing or pulling, rather than creating pressure merely at the end of the stroke. The clamp will exert up to 800 pounds pressure with normal hand operation by either a push or pull of the handle, and will automatically lock and hold work securely upon completion of the swinging movement of the handle. This device can be used as a clamp with the plunger at either extreme position, to hold parts on milling machines, drilling machines, cut-off saws, and similar equipment, or it can be employed to exert a continuous pushing or pull-



ing motion during the entire 1 1/4-inch travel movement of the plunger. Auxiliary holes are provided in the handles to facilitate such applications. Made by the Lapeer Mfg. Co., Lapeer, Mich. 98

High-Strength Aircraft Nut

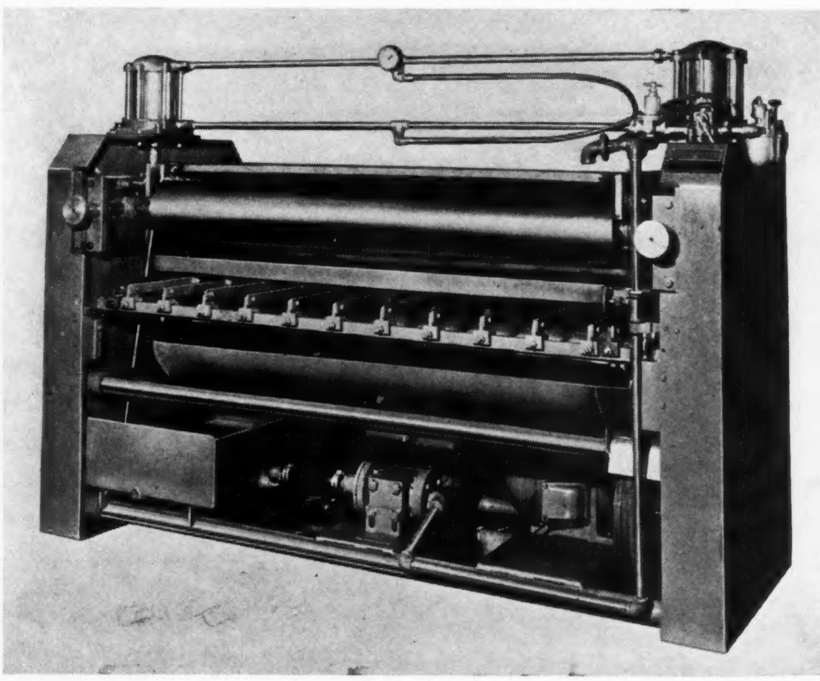
High tensile strength (185,000 pounds per square inch minimum) double hexagon nut designed for use on aircraft bolts, where weight and space limitations are major factors. Interchangeable with existing internal wrench-tightened nuts. New double hexagon design permits a weight reduction of 66 per cent and a height reduction of 50 per cent. Features include Nylon collar; forged steel body, cadmium-plated; bearing surfaces square with axis of threads within close limits; and self-locking in any position on bolt or stud. Available in National Fine Thread Series in sizes ranging from 1/4 inch to

1 1/8 inches, inclusive. Announced by Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, N. J. 99

Bertsch Machine for Applying Drawing Compound to Sheet Metal

This roll type machine, designed for the application of drawing compound to sheet metal preparatory to drawing operations in a power press, is built in many sizes and models to suit specific requirements. It is claimed that, with this machine, only one application of the drawing compound is required for several progressive drawing operations, regardless of whether the stock proceeds directly to the press from the coating machine or is stacked to await drawing operations later.

The machine assures a uniform and economical application of compound to either side, or both sides of the blank prior to its insertion in the die cavity, and offers many possibilities for mechanical or automatic feeding of the blank to the die through the coating rolls. Provision



To obtain additional information on equipment described on this page, see lower part of page 240.

EX-CELL-O

CAN GIVE YOU MORE ECONOMICAL PRODUCTION

. . . for instance: This view of the tooling on an Ex-Cell-O Precision Boring Machine shows an arrangement for precision taper turning valve plugs (*at left*) and for precision taper boring the mating bodies (*at right*). Plugs and bores must be perfectly round and straight, with tapers matched exactly, and with a mirror-like finish to assure air-tight valves. This Ex-Cell-O machine both semi-finishes and finishes both pieces in one machine cycle, producing interchangeable parts that pass air-pressure tests under water. Parts are machined at the net rate of 240 pieces per hour . . . This operation is typical of many devised by Ex-Cell-O engineers to solve precision machining problems for various industries where accuracy, fine finish, and maximum production and economy are the requirements. Maybe Ex-Cell-O can help you, too. Get in touch with your local Ex-Cell-O representative or write direct to the Ex-Cell-O head office in Detroit.

XLO
EX-CELL-O for PRECISION

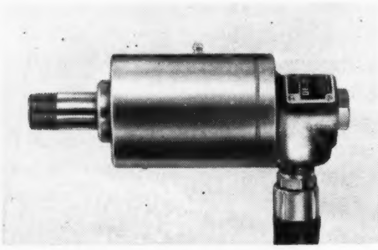
In circle to right: Brass valve body and plug finished by precision boring and turning operations on Ex-Cell-O Style 1212-A Standard Double End Precision Boring Machine.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Boring, Turning, and Facing Machines and Fixtures • Precision Cylinder Boring Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Precision Broach Sharpening Machines • Other Special Purpose Machines • Tool Grinders • Continental Cutting Tools • Broaches and Broach Fixtures • Counterbore Sets • Grinding Spindles • Hydraulic Power Units • Drill Jig Bushings • R.R. Pins and Bushings • Fuel Injection Equipment • Dairy Equipment • Aircraft and Miscellaneous Production Parts

is made for applying any desired quantity or kind of compound. Sheets up to 1/4 inch thick, of any length and in widths from 24 to 72 inches, can be coated by this machine. Designed and sold by Bertsch Machinery Co., Department C, 2832 E. Grand Blvd., Detroit 11, Mich. 100

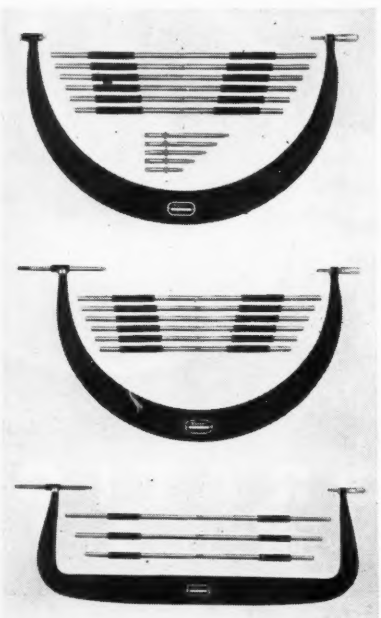


Rotating Union for Vapor, Air, or Liquid Lines

Leakproof, three-in-one rotating joint for use in connecting pipe lines to revolving shafts, cylinders, or drums for conducting heating or cooling liquids at temperatures ranging from minus 30 degrees F. to 300 degrees F. Will handle steam or air as well as liquids. Double-row ball-bearing assembly of the union reduces friction to a minimum. Made in four standard iron pipe sizes of 1/2-, 3/4-, 1-, and 1 1/2 inches. Available from Deublin Co., Northbrook, Ill. 101

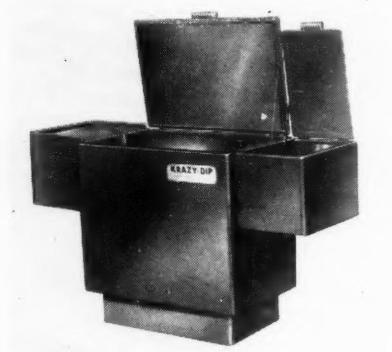
Starrett Tubular-Frame Micrometers

Micrometers with light-weight hollow steel frames of great rigidity, made in the three styles illustrated. Available in capacity ranges to suit practically any precision measuring requirements. Can be furnished with dial indicator heads and special measuring heads for direct-reading measurements. Introduced by L. S. Starrett Co., Athol, Mass. 102



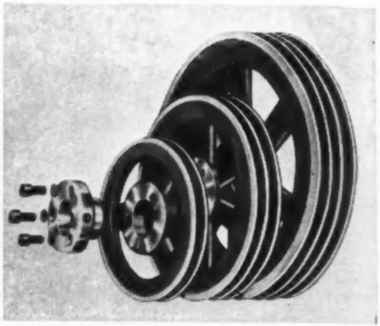
Magnus "Krazy Dip" Machine for Cleaning Metal Parts

"Krazy Dip" cleaning machine recently introduced by Equipment Division, Magnus Chemical Co., Inc., Garwood, N. J., for washing metal parts in automotive and aircraft shops, service stations, repair shops, railroad shops, and metal-working plants. This machine is fully automatic except for loading and unloading of the work. It is a cold cleaning machine. Mechanical agitation moves the parts in the cleaning solution at the rate of 160 times a minute. The air compressor is the only source of power required to operate the cleaner. The air consumption is from 1 to 2 cubic feet per minute at a minimum air pressure of 50 pounds per square inch. 103



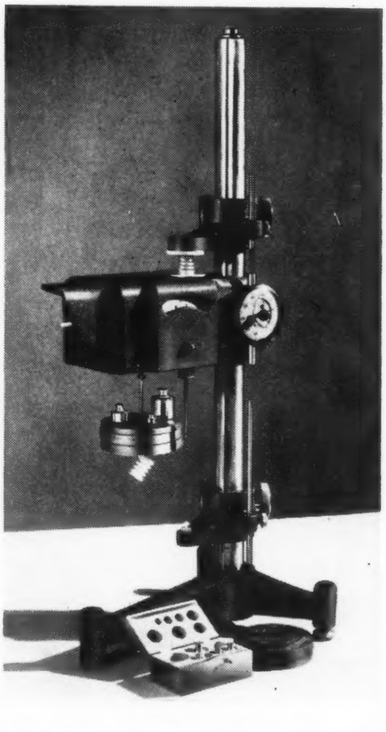
Transco Interchangeable Hub Sheave

Sheaves designed to enable rims of various diameters to be mounted interchangeably on the same hub or to permit hubs with bores of different diameters to be mounted interchangeably on the same size rim. Heat-treated socket-head screws and lock-washers secure the hub to the rim; templet-drilled threaded holes in the rim web assure complete interchangeability and quick mounting without requiring special tools. Sheave rims, made from light-weight, stress-free, semi-steel castings, are accurately machined and balanced to assure maximum belt life. Available in two- and three-groove styles for A-section belts and in combination groove A- or B-section belt types, with pitch diameters ranging from 2.2 to 18.4 inches. Made by the Transmission Machinery Corporation, P.O. Box 7823, Dallas, Tex. 104

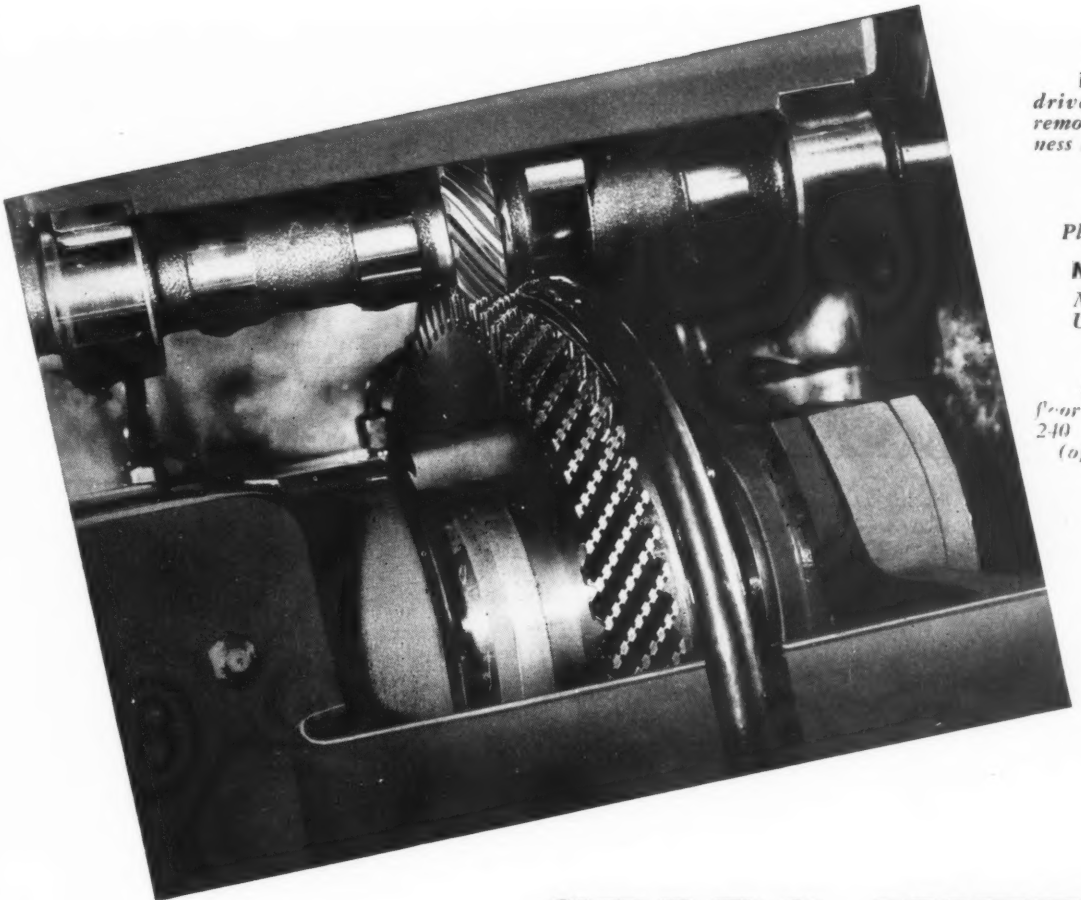


Hunter Load Tester for Coil Springs

Machine designed by the Hunter Spring Co., Lansdale, Pa., for rapid, accurate load testing of helical, compression, and tension springs. Will test 50 to 200 springs with an accuracy of one part in 2500 at maximum load in from fifteen to sixty minutes. Loads up to 5 pounds and spring lengths up to 12 inches can be handled. Ball bearings act as fulcrums for the solid-steel weighing beam, and the pointer mechanism is mounted in miniature ball bearings. The tolerance hands for "Go" and "No-Go" inspection can be externally adjusted. The dial indicator has a



To obtain additional information on equipment described on this page, see lower part of page 240.



THE JOB:

Finishing distributor drive gear. .004" to be removed on chordal thickness at ends, and .002" near center of teeth.

TOLERANCES:

Plus or minus .0005".

MACHINES USED:

Michigan Rotary Underpass Finishers.

PRODUCTION:

45 seconds per gear, floor to floor, per machine. 240 gears per man hour (operating 3 machines).

GEARS INTEGRAL WITH SHAFTS:

Finish them faster and more accurately on a Michigan Underpass

For instance, those distributor shaft drive gears on camshafts. There is no reason why you cannot make them just as quiet just as quickly as other gears shaved on Michigan gear finishers.

One company is finishing such camshaft gears in less than 45 seconds each . . . floor to floor . . . *and that's fast!* What's more, the machines are so easily operated that one man can run three of them, if you should need that much production. Or, he can run a Shear-Speed, cutting another gear, in addition to the "870" underpass shaver.

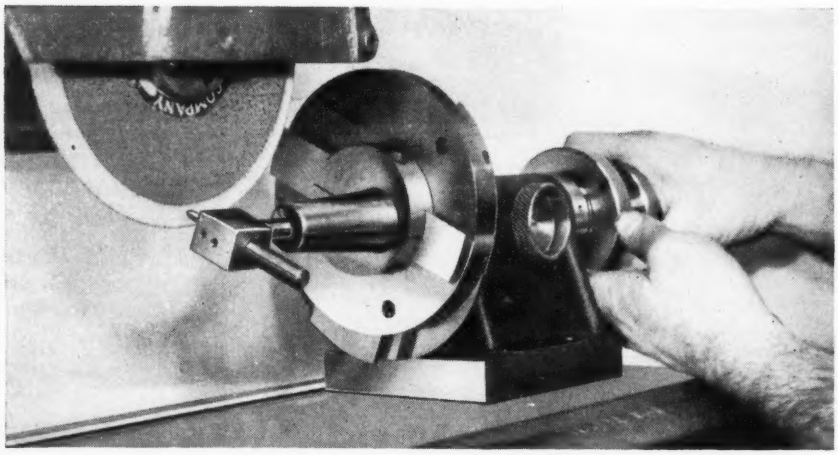
About the only difference between a camshaft gear shaving machine and a standard "870" is a somewhat longer headslide to accommodate the longer shaft, plus a couple of steady rests to support the camshaft at the bearings close to the gear being finished.

For complete information ask for Bulletin 870F

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.



1-inch range with 0.001 inch graduations. An overload spring mounted between the weighing beam and the weight pan prevents damage from excess load or shock. The machine weighs 41 3/4 pounds. 105

Arma Synchro Unit for Remote Control

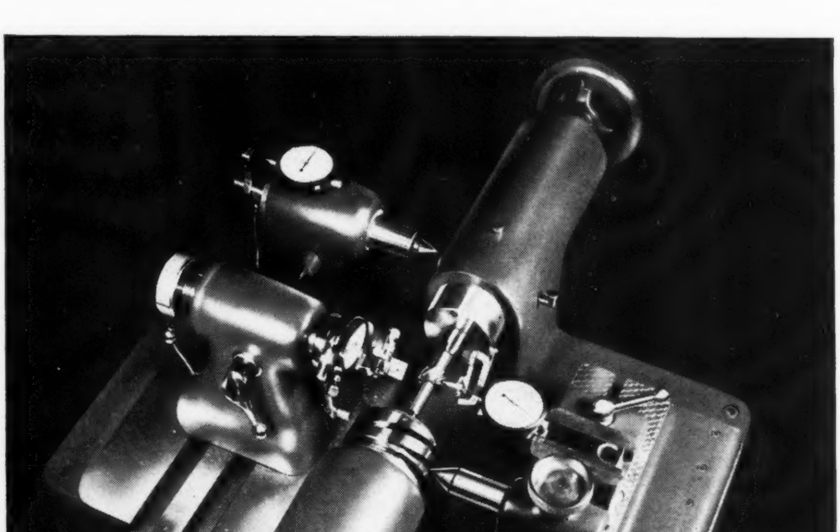
Synchro unit of a line including control transformers, motors, generators, differential motors, and differential generators, made available by the Arma Corporation, 254 Thirty-Sixth St., Brooklyn 32, N. Y., for electronic, electro-mechanical, and electro-hydraulic control systems and for remote control purposes. 106

Precision Wheel-Dresser

Precision wheel-dresser designed to permit very accurate setting for concave- and convex-wheel dressing by the use of parallels and gage-blocks. Applicable for dressing wheels used for grinding gages, forming tools, jigs, and die sections. This dresser is especially adapted for angle tangent-to-radius wheel dressing. One setting will give any two angles, as well as any set radius. For instance, it can be used to dress a wheel having a 10-degree angle surface tangent to a 1/2-inch radius-formed concave surface and a 20-degree angle surface also tangent to the 1/2-inch radius-formed surface. Brought out by the Last Word Sales & Engineering Co., Box 287, Royal Oak, Mich. 107

Small Universal Gear-Checker

Red Ring universal gear-checker of smaller and more compact design than its predecessors, which requires less floor space and is easier to move from one location to another. Announced by the National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. This gear-checker can be obtained with or without the base, permitting the table which carries the checking heads to be used on a bench or elsewhere in the plant. It handles gears up to 10 inches outside diameter, checking the lead, eccentricity, tooth spacing, and tooth parallelism.



The checker is 18 inches wide by 29 inches long and can be readily placed alongside gear cutting or finishing machines. 108

Bristol Proportioning Pyrometer Controller

Proportional current-input electronic pyrometer controller announced by the Bristol Co., Waterbury 91, Conn. This instrument proportions the current input to electrically heated furnaces, ovens, plastic molding machines, and other similar equipment, providing practically straight-line

temperature control by time modulation of the input energy. The average energy supplied is proportional to the deviation of the temperature from the control point throughout a band width which is easily adjustable. 109

To obtain additional information on equipment described on this page, see lower part of page 240.

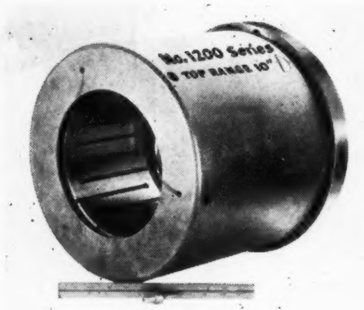
"Check-All" Comparator Gage

Universal comparator gage designed for fast handling of a large variety of production gaging jobs. This gage can be used to check many dimensions on the same or different parts by changing the plate and pin and setting up with masters. Gives multiplication of about 200 to 1 and will check up to plus or minus 0.010 inch. Brought out by Roper & Broderick, Inc., 1694 Main St., Springfield, Mass. 110

Severance Carbide Micro Center Reamers

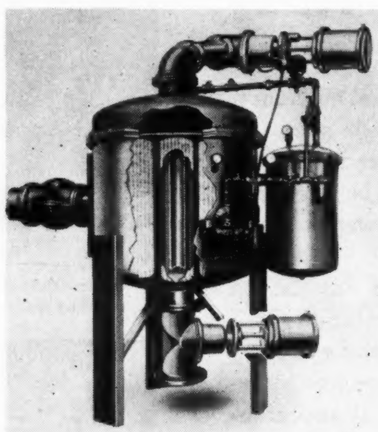
Severance Tool Industries, Inc., 636 Iowa St., Saginaw, Mich., have brought out the carbide tool illustrated for finishing center holes in parts that are to be

held on centers for machining after heat-treatment. With these reamers, a burnished-like finish can be produced in parts having a hardness up to 63-C Rockwell. The reamers have cutting teeth developed to eliminate chatter and to correct existing irregularities. They have a standard 60-degree included angle, are available in 3/8- and 1/2-inch diameter sizes, and can be reground many times. 111



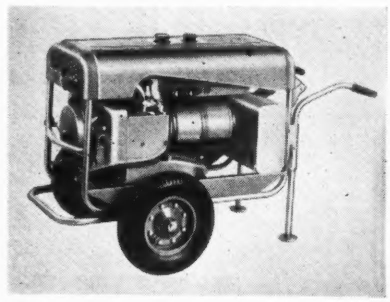
Erickson Large-Size Chuck

Large-size precision collet chuck covering a range of 8 to 10 inches in increments of 1/32 inch. This chuck is designed to grip work firmly throughout the length of the collet. Made by Erickson Tools Division, 2309 Hamilton Ave., Cleveland 14, Ohio. 112



Honan-Crane Automatic Coolant Clarifier

Automatic clarifier designed to remove abrasives, dirt, and other solid contamination from soluble coolants used in grinding, broaching, boring, milling, rolling, and other metal-working machine tools. Made in seven sizes, the smallest handling 5 to 8 gallons per minute with a 496-mesh screen and 8 to 12 gallons per minute with a 250-mesh screen. The largest clarifier handles 800 to 900 gallons per minute with a 496-mesh screen and 900 to 1000 gallons per minute with a 250-mesh screen. Developed by Honan-Crane Corporation, 912 Sixth St., Lebanon, Ind. 113

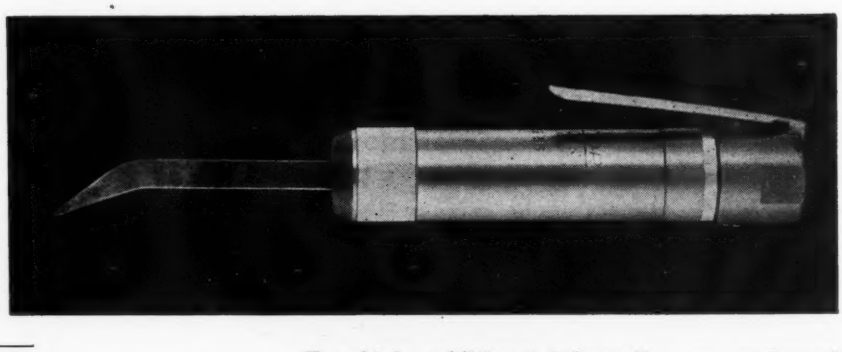


"Sureweld" Portable Welder

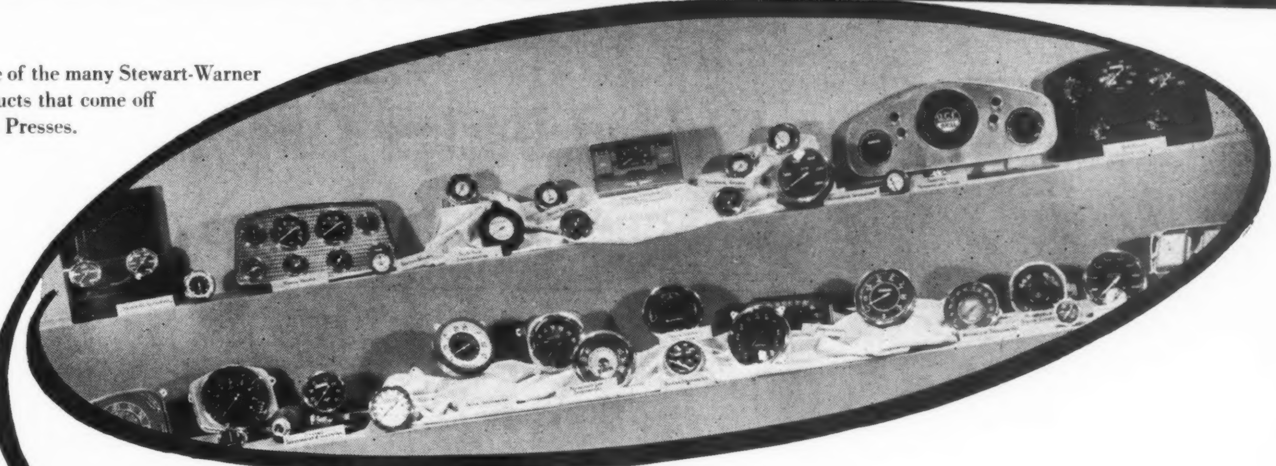
Portable direct-current 150-ampere welder, weighing only 330 pounds. Designed so that it can be wheeled close up to a job, regardless of its location. Can be stowed in small trucks, or even in the trunk compartments of large cars, and taken wherever needed. Driven by a 10-H.P. air-cooled engine. Manufactured by D. W. Onan & Sons, Inc., Minneapolis 5, Minn., and distributed in the United States by the National Cylinder Gas Co., Hollup Division, Chicago, Ill., and the Glenn Roberts Co., Indianapolis, Ind. 114

Scaling Hammer with Lever Throttle

Air-operated scaling hammer with lever throttle that permits using tool with one hand for such operations as weld flux scaling, weld spatter removal, paint scaling, and rust removal. Chisel blanks and star drills are available. Made by Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio. . 115



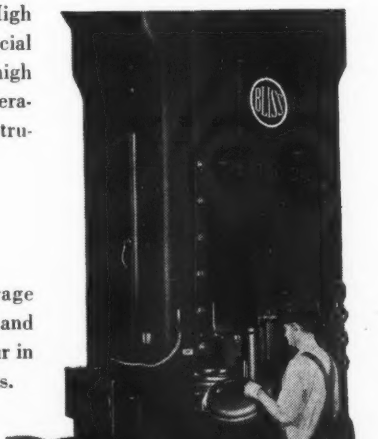
To obtain additional information on equipment described on this page, see lower part of page 240.



Some of the many Stewart-Warner products that come off Bliss Presses.

...and at Stewart-Warner 318 BLISS PRESSES

One of a battery of 10 Bliss High Production Presses, with special fixed inclined legs, used for high speed blanking and forming operations in Stewart-Warner's instrument division.



Steel covers for Alemite garage service equipment are pierced and trimmed at rate of 115 per hour in this Bliss 300-ton enclosed press.

Just picture the range of different stamping problems involved in producing such a diversified line of products as speedometers, radios, lubrication service equipment, industrial gauges, car and aircraft heaters, and hardware. That's a sampling of Stewart-Warner's line. Then consider the variety of types and sizes of presses required.

It's one reason why a high proportion of Stewart-Warner's press equipment is Bliss-Built—high production presses, batteries of inclinables, enclosed presses and coining presses, among others.

Why does Bliss have such acceptance on this and so many other pressed-metal production lines?

Because Bliss' field-trained engineers first analyze a customer's production requirement, then help select the *right press for the job.* At Stewart-Warner, high production presses were recommended for certain large quantity stampings while knuckle joint presses were adapted for sizing and swaging. The result is a steady output of uniformly good stampings produced more economically and efficiently.

Let a Bliss sales engineer help you get the most out of your presses—mechanical or hydraulic. You'll be drawing on a fund of engineering knowledge developed over 90 years. And you'll see why "Bliss" on your press is more than a name—it's a guarantee. Send for him today.

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

Mechanical & Hydraulic Presses, Rolling Mills, Container Machinery

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES AT: Detroit, Hastings, Mich.; New York, Rochester, N. Y.; Cleveland, Dayton, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.

MARQUETTE · BLISS · CONSOLIDATED · TOLEDO · BLISS BUILT

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

Converting to Welded Design Cuts Costs 20% ... Speeds Delivery

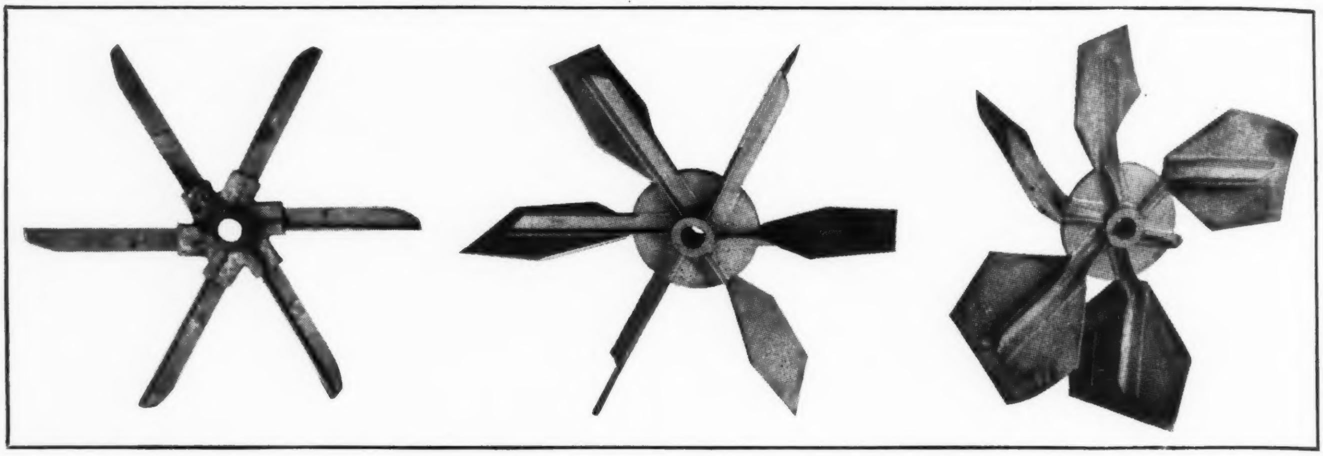


Fig. 1. Original construction. Riveted steel blades cast in iron hub. Cost approximately 25¢ per pound including riveted blades.

Fig. 2. Present all-welded steel construction. Steel blades and spokes arc welded to a steel plate hub. Cost approximately 20¢ per pound

Fig. 3. Damaged all-welded steel impeller shows welds intact.

By W. R. Patterson, Superintendent
Dixie Manufacturing Company
Baltimore, Maryland

PART of our business is building planing mill exhaust fans for all types of industrial applications. Since each unit must be built to individual order, our shop fabricating methods must be very flexible if costs are to be held down. Arc welded construction has proved to be the only practical solution to this manufacturing problem.

Arc welding enables us to use all types of mild carbon and stainless steels with a resulting stronger product. By eliminating many time-consuming delays waiting for parts originally needed for this work, our manufacturing schedule has been cut from 4 months to 4 weeks. This prompt delivery gives us a decided sales advantage to customers requiring quick shipment.

The superiority of our welded design has already received wide customer acceptance. A number of old line customers now insist they will accept nothing but welded construction.

The impeller unit (Fig. 1) was originally constructed by casting the fan blade spokes into an iron hub. To these spokes we riveted the fan blades at a total unit cost of approximately 25¢ per pound. Under heavy load conditions, a break in the hub would cause the impeller to "explode" resulting in major damage to the blower unit and bothersome delay for the customer making repairs.

The present all-welded impeller (Fig. 2) has the blade spokes, consisting of two angles, arc welded to a flame-cut steel plate hub. The blades of shear-cut plate are welded to those spokes. The cost of the arc-welded impeller is approximately 20¢ per pound, representing a reduction in cost of approximately 5¢ per pound or 20%.

The greater strength of the welded construction is illustrated by a mishap in which a heavy block was accidentally sucked into the blower intake. The photo (Fig. 3) shows how the blades were bent. Although the force of the mishap sheared the steel angles, the welds themselves remained intact.

The all-welded drive-shaft foundation base (Fig. 4) replaces a heavy cast base. Component parts are sheared from steel plate and assembled with arc welding, using "Fleetweld 7" and 400-amp. Lincoln "Shield-Arc" welders. A previous cast iron suction intake has been converted similarly to arc welded construction by fillet welding flame-cut plate to formed frame members.

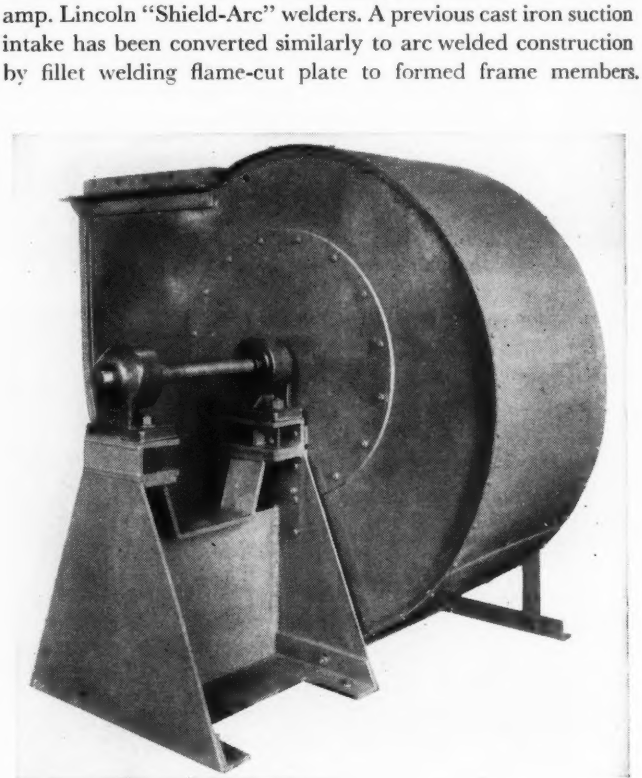
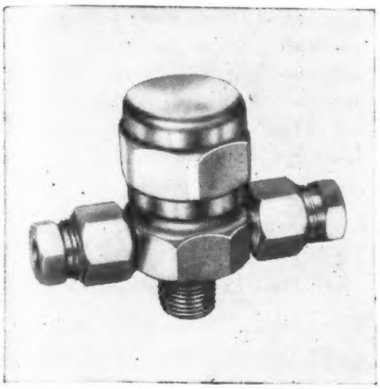
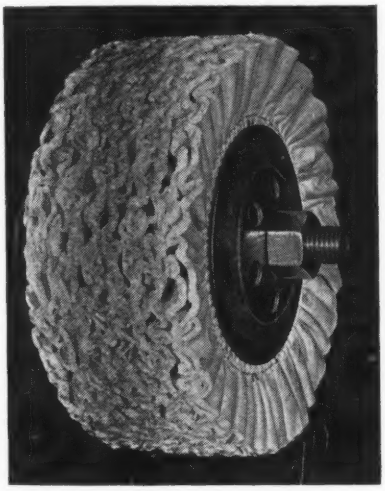


Fig. 4. Complete blower unit. Shows all-welded drive shaft base and suction intake. Cast base cost 15¢ per pound. Welded steel base cost 12¢ per pound.



Bearing Lubricator Valve

"Grannan" lubricator valve designed to deliver a positive metered amount of oil or grease to each bearing in a lubricating system under any operating temperature from 0 to 300 degrees F. Announced by Titeflex, Inc., 519 Frelinghuysen Ave., Newark 5, N. J. 116

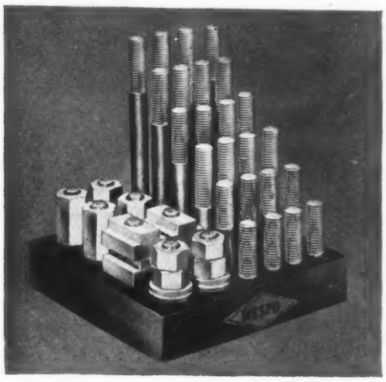


Contact Wheel for Belt Polishing

"Airway-ventilated" contact wheel for abrasive belt polishing announced by Jackson Buff Corporation, Long Island City, N. Y. This wheel has been designed for contour or flat work on stainless or carbon steel stampings, aluminum, brass, die-castings, and forgings. Offers maximum resilience, yielding readily to pressure and springing back into shape quickly when the pressure is removed. Available in 1/2-inch standard face sections and in diameters ranging from 6 to 16 inches. Face width of wheel can be changed to suit the work by using the required number of sections. 117

Stud and Nut Set for Work Clamping on Machine Tool Set-Ups

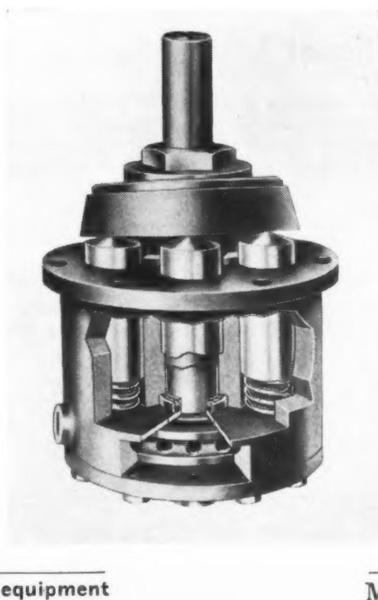
Conveniently arranged stud and nut set available in 3/4-, 5/8-, and 1/2-inch standard thread sizes, Class 3 fit. A set includes four each of 3, 4-, 5-, 6-, 7-, and 8-inch studs, four each of the nuts, washers, T-slot nuts, and

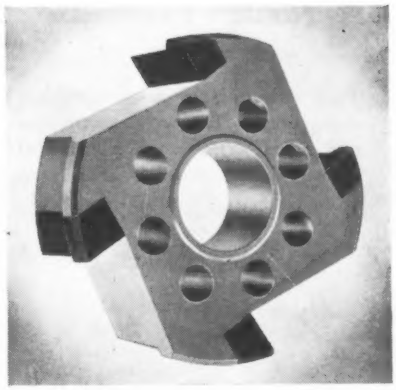


coupling nuts. Made by West Point Mfg. Co., 19627 Merriman Court, Farmington, Mich. . . 118

Dudley "Nutating Plate" Piston Type Hydraulic Rotary-Valve Pump

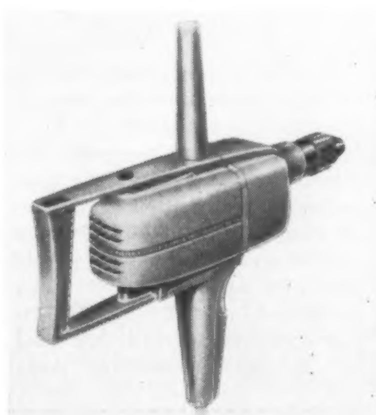
Hydraulic pump combining Dudley "Nutating Plate" principle for reciprocating the pistons with an entirely new rotary valve. Manufactured in practically all capacities used for hydraulic systems. Produced by Cannon & Co., Los Angeles, Calif., and introduced by Eastman Pacific Co., 2320 E. Eighth St., Los Angeles 21, Calif. . . 119





Circular Carbide-Tipped Turning and Chamfering Tool

Carbide-tipped circular cutter with four individual cutting edges that can be used for turning and chamfering operations on any type of automatic. This cutter can be used in all four cutting positions before the machine need be stopped for tool sharpening. Recently added to line made by R. F. Cook Mfg. Co., 2732 Second St., Cuyahoga Falls 10, Ohio. 120



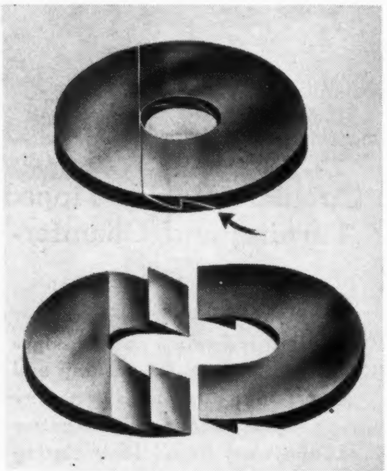
Portable Electric Drill with Balanced Armature

Portable electric drill of 1/2-inch capacity. Features include balanced armature; housing and handles of light-weight aluminum alloy; polished finish; universal alternating-direct-current motor; blower type fan for cooling; removable side handles for close-quarter drilling; Jacobs hexagonal key chuck; and Cutler-Hammer trigger switch. This drill is 15 1/2 inches long and weighs 9 pounds. It is being placed on the market by Portable Electric Tools, Inc., 255-59 West 79th St., Chicago 20, Ill. 121

To obtain additional information on equipment described on this page, see lower part of page 240.

"Noble" Two-Piece Slip Washer

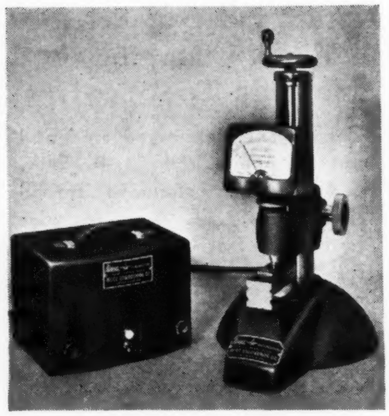
Two-piece "Noble" slip washer designed for use in construction and maintenance work. Eliminates necessity of removing nuts from bolts to insert a spacing washer



when needed. Announced by the Mershon Co., Inc., 511 E. Broadway, Glendale, Calif. 122

Merz "New-Tronic" Comparators

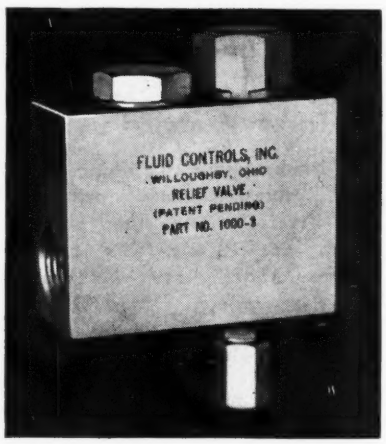
"New-Tronic" comparators for external measurements, made in four models, with fixed or adjustable work-contact pressure. All models available with two magnification scales providing ranges of plus or minus 0.0003 inch in graduations of 0.000010 inch, and plus or minus 0.003 inch calibrated in 0.0001 inch. Identical operating methods are used for all four models of these



comparators. Marketed by Merz Engineering Co., Indianapolis, Ind. 123

Pilot Relief Valve

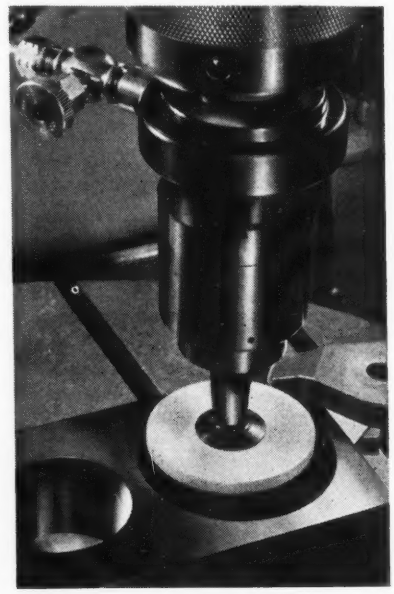
Small compact hydraulic relief valve designed to operate at pressures up to 4000 pounds per square inch. This pilot type valve is adapted for use in small hydraulic systems. It will not



leak at 90 per cent full relief pressure, gives extremely fast response to pressure surges, and weighs only 8 1/2 ounces. Made by Fluid Controls, Inc., Willoughby, Ohio. 124

"Vulcanaire" Hole-Grinding Attachment

"Vulcanaire" air-driven attachment for jig borers and other machine tools, developed for precision grinding of holes rang-



ing from 1 1/2 to 4 inches in diameter. Supplements similar attachment announced in March MACHINERY, page 183, which grinds holes from 1/16 to 1 1/2 inches in diameter. Brought out by Vulcan Tool Co., 730 Lorain Ave., Dayton 10, Ohio. ...125

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in September, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

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New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 246 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the September, 1948, Number of MACHINERY

Washers, Springs, and Other Small Parts

GEORGE K. GARRETT CO., INC., 1421 Chestnut St., Philadelphia 2, Pa. Booklet entitled "Small Parts for Better Production," containing 32 pages of specification charts on various types of washers, snap rings, springs, welded parts, small stampings, expansion plugs, ball-bearing wheels, etc., compiled to aid the designer or manufacturer in selecting the proper type to serve his purpose. Copies are obtainable if requested on a company letter-head stating the position of the writer.

Power Unit

ISLAND EQUIPMENT CORPORATION, 27-01 Bridge Plaza North, Long Island City 1, N. Y. Bulletin 12-3-48-11A, on a package power unit for driving any type of conveyor. Copies available if requested on company stationery.

Horizontal Boring, Drilling and Milling Machines

GIDDINGS & LEWIS MACHINE TOOL CO., Fond du Lac, Wis. Loose-leaf sheets to be added to the Giddings & Lewis handbook, describing applications of Giddings & Lewis horizontal boring, drilling, and milling machines in machining Diesel engines and in the profile-milling of steel rolls for steel-mill operations. 1

Meehanite Design Data

MEEHANITE METAL CORPORATION, Pershing Square Bldg., New Rochelle, N. Y. Bulletin 27, entitled "Design Data Formulas and Charts for Computing Maximum Stresses in Angles, Ribbed Plates, and Shear-Resistant Webs Containing Cut-Outs," together with supplement giving examples of applications of the data. 2

Grinding Machines

THOMPSON GRINDER CO., Department 40, Springfield, Ohio. General catalogue covering hydraulic surface grinders, heavy-duty grinders, tool-room grinders, contour grinders, and broach grinders. Includes data on crush form-grinding, and case histories of the application of "Truforming." 3

Grinding, Polishing and Deburring Machinery

HAMMOND MACHINERY BUILDERS, INC., Department GP-14, 1600 Douglas Ave., Kalamazoo, Mich. Catalogue 325, describing the Hammond complete line of grinding, polishing, and deburring machines, and their application. 4

Hydraulic Cylindrical Grinders

LANDIS TOOL CO., 12 E. Sixth St., Waynesboro, Pa. Catalogue F-48, describing and illustrating the Landis Type F series of hydraulic cylindrical grinding machines, consisting of plain, gap, and roll grinders. Complete specifications are included. 5

Friction Clutches

LINK-BELT CO., 307 N. Michigan Ave., Chicago 1, Ill. Folder 1972-A, containing dimensions and list prices covering the Link-Belt "Beyl" single-adjustment friction clutch and coupling. 6

Automatic Balancing of Grinding Wheels

CINCINNATI GRINDERS, INC., Cincinnati 9, Ohio. Bulletin G-583, entitled "Automatic Balancing of Grinding Wheels," describing the new automatic wheel balancing mechanism incorporated in Cincinnati Filmatic grinders. 7

Laboratory Press

HYDRAULIC PRESS MFG. CO., 1042 Marion Road, Mount Gilead, Ohio. Bulletin 4801, illustrating and describing the company's new 20-ton capacity self-contained laboratory press, for briquetting, tensile and compression testing, extracting, laminating, compression molding, etc. 8

Engraving Lathe

MONARCH MACHINE TOOL CO., Sidney, Ohio. Bulletin 2502, illustrating and describing the operation of the new "Shapemaster" engraving lathe, designed to engrave intricate shapes and designs heretofore produced only by hand engraving. 9

Bearings of Welded Design

JAMES F. LINCOLN ARC WELDING FOUNDATION, Cleveland 1, Ohio. Pamphlet entitled "Elastic Matching Improves Bearing Life and Performance," containing one of the award-winning papers in the recent "Design-for-Progress Program." 10

"Select-O-Matic" Power-Press Feed Unit

EARL ELWYN SMITH & ASSOCIATES, P. O. Box 53, West Hartford 7, Conn. Bulletin describing the

action of a new power-press feed unit, designated "Select-O-Matic," for feeding coil stock through the dies. 11

Cellophane Identification Tape

TOPFLIGHT TAPE CO., York, Pa. Bulletin entitled, "Methods Engineers Specify Topflight Tape," describing specific applications of this tape in a number of manufacturing plants. 12

Toolmaker's Microscope

GEORGE SCHERR CO., INC., 199 Lafayette St., New York 12, N. Y. Folder illustrating and describing the Wilder toolmaker's microscope for checking threads, angles, tapers, bevels, and other work.....13

Hydraulic Presses for Plastic Molding

R. H. WOOD CO., Public Ledger Bldg., Philadelphia 5, Pa. Bulletin illustrating typical examples of the various types of plastic-molding hydraulic presses made by the company. 14

Precision Motorized Spindles

POPE MACHINERY CORPORATION, 261 River St., Haverhill, Mass. Catalogue 58, containing complete data for selecting the right heavy-duty, precision motorized spindle and wheel-holder or cutter-head for various applications. 15

Eye Shields

CHICAGO EYE SHIELD CO., 2300 Warren Blvd., Chicago 12, Ill. Catalogue containing 64 pages on the Cesco line of protective goggles and other safety equipment, together with instructions on their use and safety hints. 16

Safety-Aid Dial

DAVIS EMERGENCY EQUIPMENT CO., INC., 45 Halleck St., Newark 4, N. J., is distributing a quick-reference "Safety-Aid Dial," indicating safety hazards commonly encountered in industry and preventive measures. 17

Bronze Bushing Stock Guide

SHENANGO-PENN MOLD CO., Dover, Ohio. Wall chart listing sizes of bronze bushing bar stock available for immediate delivery and also giving approximate weights of tubular bar stock and solid round bars. 18

Pillow Blocks

S K F INDUSTRIES, INC., Philadelphia 32, Pa. Abridged edition of the S K F general catalogue on ball and roller bearings, containing a special section on the mounting, lubrication and maintenance of pillow blocks. 19

Armored Crane Wheels

PITTSBURGH GEAR CO., 27th and Smallman Sts., Pittsburgh 22, Pa. Circular describing the advantages of Pittsburgh armored crane track wheels, designed to provide extra strength and long wearing service. 20

Surface Grinding

BLANCHARD MACHINE CO., 64 State St., Cambridge 39, Mass. Handbook for operators of Blanchard grinding machines designed to assist them in attaining maximum quality and quantity. 21

Welding Guns

PROGRESSIVE WELDER CO., 3050 E. Outer Drive, Detroit 12, Mich. Technical Bulletin 402, describing the company's new standardized welding guns, built up from interchangeable components. 22

Blast-Cleaning Equipment

PANGBORN CORPORATION, 1406 Pangborn Bldg., Hagerstown, Md. Bulletin 1200, describing the construction of Rotoblast airless cleaning equipment, dust control equipment, etc. 23

Electrode Chart

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis. Bulletin W-19, containing a chart which lists recommended arc-welding electrodes for joining similar or dissimilar metals. 24

Screw-Thread Inserts

HELI-COIL CORPORATION, 47-23 Thirty-fifth St., Long Island City 1, N. Y. Bulletin 248, containing the latest design data, tables, and examples of applications of Heli-Coil screw-thread inserts. 25

Hydraulic Pumps

CANNON & CO., 2320 E. 8th St., Los Angeles 21, Calif. Bulletin on the Dudley "Nutating" plate pump for oil hydraulic working pressures up to 3000 pounds per square inch. 26

Permanent Magnets

GENERAL ELECTRIC CO., Chemical Department, Pittsfield, Mass. Bulletin CDM-12, describing the General Electric line of permanent magnets, holding assemblies, and other metallurgical products.....27

Countersinks

SEVERANCE TOOL INDUSTRIES, INC., 636 Iowa Ave., Saginaw, Mich. Bulletin 16-C, listing the company's line of "chatterless" countersinks, ball-seat reamers, ball-nose drills, etc. 28

Pulley Drives

CONGRESS DRIVES DIVISION, Tann Corporation, 3750 E. Outer Drive, Detroit 12, Mich. Bulletin CD-300, listing Congress standardized vee and flat belt drives for light machinery. 29

Mechanical Finishing and Deburring

STURGIS PRODUCTS CO., Sturgis, Mich. Booklet illustrating and describing in detail the Roto-Finish mechanical deburring and finishing process. 30

Drafting Templets

RAPIDESIGN, INC., P.O. Box 592, Glendale, Calif. Catalogue 48, listing various types of "Time-Saver" templets for engineers, designers, draftsmen, and architects. 31

Precision Gage-Blocks

WEBBER GAGE CO., 12900 Triskett Road, Cleveland 11, Ohio. Folder listing standard "Micro-Accurate" gage-block sizes and describing methods of manufacturing. 32

High-Speed Grinding Wheels

UNITED STATES RUBBER CO., Fort Wayne, Ind. Catalogue covering high-speed grinding wheels for use in steel mills, foundries, and metal fabricating plants. 33

Stainless-Steel Equipment

JENSEN MACHINERY CO., INC., Bloomfield, N. J. Bulletin 51, showing typical examples of fin-

ished stainless-steel custom-built equipment produced by the company. 34

Multiple-Spline Screws

BRISTOL Co., Waterbury 91, Conn. Folder DM-860, containing information on the application of multiple-spline and hexagon-socket set and cap-screws. 35

Threadless Fittings

STANLEY G. FLAGG & Co., INC., 1421 Chestnut St., Philadelphia 2, Pa. Circular describing Flagg-Flow threadless malleable fittings for brazed iron pipe joints. 36

Dial Measuring Instruments

B. C. AMES Co., 27 Ames St., Waltham 54, Mass. Catalogue 57, containing condensed data on Ames micrometer dial gages, indicators, and comparators. 37

Electronic Adjustable-Speed Motor Control

J. B. LEWIS & Co., 3324 Main St., Hartford 5, Conn. Bulletin 105, describing a new electronic adjustable-speed motor control...38

High-Speed Reamers

U. S. TOOL & MFG. Co., 6906 Kingsley Ave., Dearborn, Mich. Price list of standard and special high-speed reamers made by an entirely new rolling process.....39

Flexible Couplings

AJAX FLEXIBLE COUPLING Co., INC., Westfield, N. Y. Catalog 48, containing 24 pages of working data on the complete line of Ajax flexible couplings. 40

Notching Units

WALES - STRIPPIT CORPORATION, 345 Payne Ave., North Tonawanda, N. Y. Catalogue N, describing Wales notching units for steel sheets and angles. 41

Resistance Welding Machines

TAYLOR-WINFIELD CORPORATION, Warren, Ohio. Bulletin 3-123, descriptive of Type ENB press-type welders, designed for spot and projection welding. 42

Centrifugal Pumps

DE LAVAL STEAM TURBINE Co., Trenton 2, N. J. Bulletin 83-29, describing the outstanding features of De Laval single-stage centrifugal pumps. 43

Photomicrographic Equipment

BAUSCH & LOMB OPTICAL Co., Rochester 2, N. Y. Catalogue E-210, descriptive of the Bausch & Lomb new Model L photomicrographic equipment. 44

Stock Pushers

SHEFFER COLLET Co., Traverse City, Mich. Leaflet describing the Sheffer "Economy" stock pusher designed to feed to the very end of the stock. 45

Spray Painting Equipment

BINKS MFG. Co., 3114-40 Carroll Ave., Chicago 12, Ill. Catalogue 953, containing 122 pages of data on Binks spray painting equipment. 46

Adjustable Link V-Belts

MANHEIM MFG. & BELTING Co., Manheim, Pa. Catalogue describing the construction and application of the Veelos adjustable link V-belt. 47

Steel

LUKENS STEEL Co., Coatesville, Pa. Booklet entitled "A Visit to Lukens," containing a description of the various Lukens plants, mills, and departments. 48

Gearmotors

LINK-BELT Co., 307 N. Michigan Ave., Chicago 1, Ill. Catalogue 1815, containing data on Link-Belt gearmotors. 49

Selection of Electric Motors

ALLIS-CHALMERS MFG. Co., Milwaukee 1, Wis. Bulletin entitled "Handy Guide for Quick Selection of Electric Motors." 50

Flexible Couplings

B. F. GOODRICH Co., Akron, Ohio. Bulletin 2197, on Goodrich flexible couplings for all direct-connected drives. 51

Floating Disk Clutches

CARLYLE JOHNSON MACHINE Co., Manchester, Conn. Installation and Data Book 48, on Maxitorq floating-disk clutches. 52

Rebuilt Machines

MILES MACHINERY Co., Saginaw, Mich. Catalogue 189, listing the rebuilt machines now available from this company. 53

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (September, 1948) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

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By E.S.S.

The Place to Sell

MACHINERY's research department has prepared a folder which briefly describes the results of a study made by us on the geographical distribution of 1947 machine tool sales. The information is supplied in two ways—by table and by map—so that if you're the type who can't digest statistics, you can study the blacked-in and pepper-and-salt areas on the map, and vice-versa. By consulting this folder, you won't try to market a 10-H.P. machine in a by-pass of the United States unless you're a pioneer. Interested? Write and ask us for a copy. f.c.f.s. (first come, etc.)

Memory Lane

Summertime brought forth a letter of reminiscences from an old-time employe of MACHINERY—Albert L. Graffam—who, as a special representative for three years, traveled the countryside in 1896: "I selected a bicycle as the most suitable means of transportation. There were no autos or motorcycles on the road in those days. During that summer, I visited practically all of the plants where mechanics were employed in the state of Maine, going as far north as Presque Isle and Fort Fairfield where I crossed the line into foreign territory for the first time just to see how it would feel. I couldn't see that the sunshine was any brighter on one side than the other."

Later, our voyager found himself down in Kentucky and commented: "The weather sure was hot at that season for a Yankee to be riding a bicycle."

Mr. Graffam then returned to his native heath, married the girl he had in mind while on his grand tour, and set up a "Make and Fix Shop" in Lynn, Mass., which he still operates.

He Has Troubles (Chinese Ones)

From Kinghazek Keelun, in Taiwan, China, a Chinese draftsman wrote to us (in English) for advice because of his blueprinting troubles. "First of all," he says, "the homemade blueprinting paper process we use takes too much time, causing too expansive (expensive? Ed.) labor cost and slow production rate. Second, the paper is usually to be broken when washing in the water. Third, the color of the blueprinting is hardly to be controlled." Then he added, "We hope to change the method but lack of sense." We offered suggestions (also in English) on blueprinting know-how. The word *know-how* was not used in our letter, however, for fear that it might sound like pidgin English to our literal Chinese correspondent.

Thanking Uncle Marshall (Alias Sam)

An Amsterdam company wrote to us, "Grace to the Marshall Help it will be possible to resume the import of U.S.A. books to a limited amount." They then informed us that under new regulations when billing them for books and periodicals, five copies of the bill signed by the publisher would be required. The letter ended, "Although the dollar allocation will not enable us to fulfill the demand entirely, the Dutch book trade is grateful to the generous Marshall help."

At-the-Grindstone—LOUIS KASPER, a Philadelphian, has been a consistent contributor to MACHINERY for the last sixteen years. It was natural that he competed in our 1946 Ingenious Mechanism contest and came off with one of the eight prizes awarded (and without guessing a 1910 musical tune). He started his shop training in the old days, he says, "when 18-inch bastard files were in common use," and passed through the various stages of training from grease monkey to toolmaker. For twenty-three years he was foreman of a tool and die shop and today is mechanical supervisor in a plant of 1200 employes. Despite the twinkle in his eye, Mr. Kasper assures us that his favorite hobbies are poring over mathematical problems and writing for technical publications. We have sufficient evidence on hand of these inclinations (which you too may witness on page 199 of this issue) but we are concerned about that twinkle. Hermitic sessions with arithmetic figures and engineering terminology don't seem to account for it. What does, Mr. Kasper?

News of the Industry

Arkansas and Virginia

NORTON Co., Worcester, Mass., has appointed GEORGE C. GIBBONS resident manager of the company's bauxite plant in Bauxite, Ark. Mr. Gibbons succeeds C. LAWTON RUCKER, who is retiring after thirty-two years of service with the company.

CHAIN BELT Co. announces the opening of a new district sales office at 2900 W. Clay St., Richmond 21, Va., with FRED W. TAYLOR as district manager.

California

DOUGLAS AIRCRAFT Co., Santa Monica, Calif., has formed a separate division for the manufacture of a wide variety of pressed-metal products. HARRY WOODHEAD, recently president of the Consolidated-Vultee Aircraft Corporation and prior to that a prominent executive in the pressed-steel products business, has been made general manager of the new division. A. W. LARSEN will act as his assistant.

AMERICAN BRASS and COPPER SALES Co., 1920 Union St., Oakland 7, Calif., has been named distributor for the special aluminum mill products manufactured by the REYNOLDS METALS Co., Louisville, Ky.

WALTER GEORGE WHEELER has been appointed chief engineer of the Hufford Machine Works, Inc., Redondo Beach, Calif., manufacturers of hydraulic stretch-forming machines, hydraulic presses, and special hydraulic equipment. Mr. Wheeler joined the company in December, 1947.

Walter G. Wheeler, Newly Appointed Chief Engineer of Hufford Machine Works

CUTLER-HAMMER, INC., Milwaukee, Wis., manufacturer of electrical apparatus, has acquired the business of the West Electric Products Co., 1795 Pasadena Ave., Los Angeles, Calif. W. G. TAPPING, district sales manager of Cutler-Hammer, will be in charge of the new plant.

Illinois and Indiana

ARMSTRONG BROTHERS TOOL Co. has recently erected a new building at 5300 W. Armstrong Ave., Chicago, Ill. The building, which is a one-story construction, affords 170,000 square feet of manufacturing space. It is equipped with air-conditioning, and liberal use is made of glass to obtain maximum daylight.

DAVID K. COLESBERRY has been appointed general sales manager of the Harrington & King Perforating Co., 5655 Fillmore St., Chicago 44, Ill. He was previously connected with the Sharples Corporation, Philadelphia, Pa.

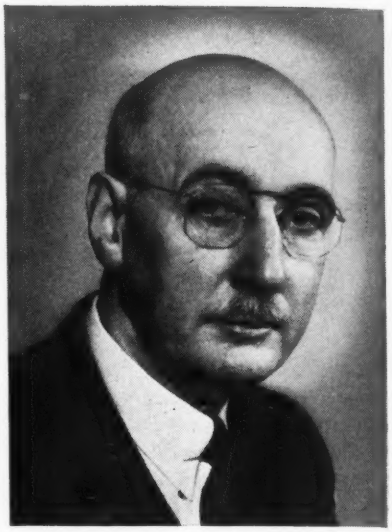
MEAD SPECIALTIES Co., Chicago 41, Ill., has appointed the R. M. WRIGHT Co., 7401 Du Bois St., Detroit, Mich., and the JACKSON-WALTER Co., 210 N. Thirteenth St., Philadelphia, Pa., agents for the company's line of air cylinders, work-feeders, and other air-operated devices.

GEROTOR MAY CORPORATION, Baltimore, Md., manufacturer of air and hydraulic devices for industrial application, has appointed the MACMILLAN ENGINEERING CORPORATION, 208 S. LaSalle St., Chicago, Ill., sales representative of the company.

J. J. TOPOLINSKI, works manager of Skilsaw, Inc., Chicago, Ill., has been elected vice-president in charge of manufacturing.

AN-DEAN MFG. Co., Inwood, Ind., announces a "Jiffy Production Service" for manufacturers and punch press shops that operate dies, jigs, and fixtures. This service consists of a new method of tipping and centering salvaged punches so that hardened punches can be ground down and used for smaller-sized holes.

CARROLL W. EVANS has been appointed general superintendent of the main service parts plant of Studebaker Corporation, South Bend, Ind.



Thor M. Olson, Who has Resigned as Vice-president in Charge of Sales for the Ex-Cell-O Corporation

Michigan

THOR M. OLSON has resigned the position of vice-president in charge of sales of the Ex-Cell-O Corporation, Detroit, Mich. He has been connected with the company since April 30, 1930, when the Continental Tool Works, which was founded by Mr. Olson, became merged with the Ex-Cell-O Corporation.

A. M. FLEMING, for eleven years general works manager of the Chrysler Division, Chrysler Corporation, Detroit, Mich., has been promoted to the position of vice-president in charge of manufacturing of that division. FRED A. WUNDERLICH succeeds Mr. Fleming as general works manager.

WALTER R. TURNER has been elected vice-president in charge of production of the Bulldog Electric Products Co., Detroit 32, Mich. Mr. Turner joined the company in 1945 as production manager after nearly twenty years' association with the Chevrolet Motor Division of General Motors.

BOUND BROOK OIL-LESS BEARING Co., Bound Brook, N. J., announces that the EYNON-DAKIN Co., 1847 W. Bethune Ave., Detroit 6, Mich., will carry a complete stock of Compo oil-retaining porous bronze bearings and other Bound Brook products at its warehouse.

RAPIDS-STANDARD Co., INC., Grand Rapids, Mich., maker of material-

handling equipment, announces the adoption of the term "RapiStan" as a trademark to designate all equipment manufactured by that company.

Frederick M. Bock has been appointed assistant to the president of Pioneer Engineering & Mfg. Co., Detroit, Mich. Mr. Bock was previously assistant to the works manager of the Burroughs Adding Machine Co.

American Swiss File & Tool Co., Elizabeth, N. J., has appointed Harry C. Goodale, Jr., Middle Western sales representative of the company, with headquarters in Detroit, Mich.

A. E. Whyman, managing director of E. W. Bliss (England) Ltd., has been elected vice-president in charge of European operations of the E. W. Bliss Co., Detroit, Mich.

John H. Roehm has been appointed sales manager of the Lubricating Device Division of the Bowen Products Corporation, Ecorse, Mich.

New England

Ray H. Morris & Co., Inc., 7 S. Main St., West Hartford 7, Conn., announces a sales and service organization for users of automatic and hand screw machines in the New England area. This organization is acting as a distributor of collets, feed-fingers, and other parts used on the automatic screw machines made by the Brown & Sharpe Mfg. Co., Providence, R. I. The company will also handle lathe collets and feed-fingers for multiple-spindle automatics made by the Sheffer Collet Co., Traverse City, Mich.

Walter C. Reed, for twenty years associated with the General Electric Co., Pittsfield, Mass., as a development engineer, has retired and established a consulting engineering office at North St., Dalton, Mass. He will specialize in brazing, soldering, and materials.

Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass., has been given charge of the distribution of the thread milling machines made by the Waltham Machine Works, Waltham, Mass., and will handle all sales of machines or parts through its field representatives.

J. E. Hines, sales manager for C. I. Hayes, Inc., of Providence, R. I., has retired after twenty-six years of service in that post. He has been closely identified with the electric furnace industry for nearly forty years, having previously been connected with the Hoskins Mfg. Co. of Detroit, Mich., for thirteen years. Mr. Hines will continue to serve the company in an advisory capacity.

Lovejoy Tool Co., Inc., Springfield, Vt., has recently moved into a new plant adjacent to its former plant on Main St. The present enlarged quarters, which provide 33,000 square feet of floor space, will allow maximum production of the company's line of inserted-tooth milling cutters.

New York and New Jersey

David F. Robinson and William E. Rudel have been appointed vice-presidents and district sales managers of the Rudel Machinery Co., Inc., 100 E. 42nd St., New York 17, N. Y. Mr. Robinson will have charge of the New York and Hartford territories, and Mr. Rudel will have charge of the Boston office and the other five New England states. Ransom Soper has recently joined the organization to take over the Long Island territory. George E. Tcimpidis has also joined the company as chief engineer; and J. E. Baxley has been appointed hydraulic engineer, specializing on the Logansport Machine Co.'s products.

Walter E. Mackley has been appointed manager of the New York district sales office of American Steel & Wire Co., subsidiary of the United States Steel Corporation, succeeding B. W. Bennett, who has become assistant to the vice-president in charge of sales. F. L. Nonnemacher has been named manager of manufacturers' product sales to succeed Mr. Mackley, while Harold Christopher has been promoted to the position of assistant manager.

American Standards Association, 70 E. 45th St., New York 17, N. Y., announces its incorporation under the laws of the state of New York. Hereafter the name of the Association should be written American Standards Association, Inc. Frederick R. Lack, vice-president of the Western Electric Co., is president of the incorporated Association. Vice-Admiral G. S. Hussey, Jr. (U. S. N. Ret.) is secretary and administrative head, and Cyril Ainsworth is technical director.

Colonel Leslie S. Fletcher has been made president of Sam Tour & Co., Inc., 44 Trinity Place, New York, N. Y., the position previously held by Mr. Tour, and will also continue as technical director. This company is a member of the American Council of Commercial Laboratories, a group of thirty-nine laboratories specializing in testing, research, and inspection for all branches of industry.

George Haiss Mfg. Co., Inc., Division of Pettibone Mulliken Corporation, New York City and Chicago, manufacturer of material-handling equipment, has announced the appointment of the following sales representatives: John F. Day, 1060 Kenmore Ave., Buffalo, N. Y.; J. Ben-Atar, 232 E. 86th St., Brooklyn, N. Y.; and H. D. Williams, 6212 Homer St., Philadelphia 44, Pa.

C. J. Tagliabue Corporation, manufacturer of industrial instruments for indicating, recording, and controlling temperature and pressure, has announced the opening of a new sales office at 150 Broadway (Room 1805), New York 7, N. Y. L. M. Hackenberg, the New York district sales manager, is in charge of this office.

John S. Barnes Corporation, Rockford, Ill., manufacturer of hydraulic structures, pumps, controls, and fluid power units, announces the appointment of Nielsen Hydraulic Equipment, Inc., 441 Lexington Ave., New York 17, N. Y., as sales representative of the company.

Hammond Machinery Builders, Inc., Kalamazoo, Mich., manufacturer of grinding and polishing machines, announces the appointment of Arthur L. Perkins, 5C River Park Apts., White Plains, N. Y., as eastern representative.

Michael Stumm has been appointed manager in charge of the advertising department of the Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.

Kenneth F. Whitfield, formerly assistant general sales manager of the Walker-Turner Co., has been appointed advertising and sales promotion manager of the newly acquired Walker-Turner Division of the Kearney & Trecker Corporation, Plain-

Kenneth F. Whitfield, Advertising and Sales Promotion Manager for the Walker-Turner Division of Kearney & Trecker Corporation

SELECTION OF V-BELT DRIVES FOR MACHINE TOOLS—5

Table 6. Nominal Horsepower Ratings per Belt

Belt Speed S, Feet per Minute	V-Belt Cross-Section																			
	A				B				C				D				E			
	Pitch Diameter, *pd*, of Smaller Sheave, Inches																			
	3.0	3.8	4.6	5.0 and Up	5.8	6.2	6.6	7.0 and Up	9.0	10.0	11.0	12.0 and Up	14.0	15.0	16.0	17.0 and Up	22.0	24.0	26.0	28.0 and Up
1000	0.7	0.9	1.0	1.0	1.5	1.6	1.7	1.8	2.8	3.1	3.4	3.6	5.6	6.1	6.5	6.8	9.0	9.8	10.5	11.1
1100	0.7	1.0	1.1	1.1	1.6	1.7	1.8	1.9	3.1	3.5	3.7	3.9	6.2	6.7	7.2	7.5	9.8	10.8	11.6	12.2
1200	0.8	1.0	1.2	1.2	1.7	1.8	1.9	2.0	3.4	3.8	4.0	4.3	6.7	7.3	7.7	8.2	10.7	11.7	12.6	13.3
1300	0.9	1.1	1.3	1.3	1.9	2.0	2.1	2.2	3.7	4.1	4.4	4.6	7.2	7.8	8.4	8.8	11.6	12.7	13.6	14.4
1400	0.9	1.2	1.4	1.4	2.0	2.1	2.2	2.3	3.9	4.4	4.7	5.0	7.8	8.4	9.0	9.4	12.4	13.6	14.6	15.4
1500	1.0	1.3	1.4	1.5	2.1	2.3	2.4	2.5	4.2	4.6	5.0	5.3	8.2	9.0	9.6	10.1	13.2	14.5	15.6	16.5
1600	1.0	1.3	1.5	1.6	2.3	2.4	2.5	2.6	4.5	4.9	5.3	5.7	8.8	9.5	10.2	10.7	14.1	15.4	16.6	17.5
1700	1.1	1.4	1.6	1.7	2.4	2.5	2.7	2.8	4.7	5.3	5.6	6.0	9.3	10.1	10.8	11.4	14.9	16.3	17.5	18.6
1800	1.2	1.5	1.7	1.8	2.5	2.7	2.8	2.9	5.0	5.5	5.9	6.3	9.8	10.6	11.3	12.0	15.7	17.2	18.5	19.6
1900	1.2	1.6	1.8	1.9	2.6	2.8	3.0	3.1	5.2	5.8	6.2	6.6	10.2	11.1	11.9	12.6	16.4	18.0	19.4	20.6
2000	1.3	1.6	1.9	2.0	2.8	2.9	3.1	3.2	5.5	6.1	6.5	7.0	10.7	11.7	12.5	13.2	17.2	18.9	20.3	21.6
2100	1.3	1.7	2.0	2.1	2.9	3.1	3.2	3.4	5.7	6.3	6.8	7.3	11.2	12.2	13.0	13.8	18.0	19.7	21.2	22.5
2200	1.4	1.8	2.0	2.2	3.0	3.2	3.4	3.5	5.9	6.6	7.1	7.6	11.7	12.7	13.6	14.4	18.7	20.6	22.1	23.5
2300	1.4	1.8	2.1	2.3	3.1	3.3	3.5	3.6	6.2	6.8	7.4	7.9	12.1	13.2	14.1	14.9	19.4	21.4	23.0	24.4
2400	1.4	1.9	2.2	2.3	3.2	3.4	3.6	3.7	6.4	7.1	7.7	8.2	12.6	13.7	14.6	15.5	20.1	22.2	23.9	25.3
2500	1.5	2.0	2.3	2.4	3.3	3.5	3.7	3.9	6.6	7.3	8.0	8.5	12.9	14.1	15.1	16.0	20.8	23.0	24.7	26.3
2600	1.6	2.0	2.3	2.5	3.4	3.6	3.8	4.0	6.8	7.6	8.2	8.8	13.4	14.6	15.6	16.6	21.5	23.7	25.5	27.1
2700	1.6	2.1	2.4	2.6	3.5	3.7	3.9	4.1	7.0	7.8	8.4	9.0	13.8	15.0	16.1	17.1	22.1	24.4	26.4	28.0
2800	1.6	2.1	2.5	2.6	3.6	3.8	4.1	4.3	7.2	8.0	8.7	9.3	14.1	15.5	16.6	17.6	22.8	25.1	27.1	28.9
2900	1.6	2.2	2.6	2.7	3.7	3.9	4.2	4.4	7.4	8.3	9.0	9.6	14.5	15.9	17.0	18.1	23.4	25.8	27.9	29.7

Compiled by Rubber Manufacturers Assn.

SELECTION OF V-BELT DRIVES FOR MACHINE TOOLS—6

Table 6. Nominal Horsepower Ratings per Belt (Continued)

Belt Speed S, Feet per Minute	V-Belt Cross-Section																			
	A				B				C				D				E			
	Pitch Diameter, *pd*, of Smaller Sheave, Inches																			
	3.0	3.8	4.6	5.0 and Up	5.8	6.2	6.6	7.0 and Up	9.0	10.0	11.0	12.0 and Up	14.0	15.0	16.0	17.0 and Up	22.0	24.0	26.0	28.0 and Up
3000	...	2.2	2.6	2.7	3.8	4.0	4.3	4.5	7.6	8.5	9.2	9.8	14.9	16.3	17.5	18.6	24.0	26.5	28.6	30.5
3100	...	2.3	2.6	2.8	3.9	4.1	4.4	4.6	7.8	8.7	9.5	10.1	15.2	16.7	17.9	19.0	24.5	27.2	29.4	31.3
3200	...	2.3	2.7	2.9	4.0	4.2	4.5	4.7	7.9	8.9	9.7	10.3	15.6	17.1	18.4	19.5	25.1	27.8	30.1	32.0
3300	...	2.4	2.7	2.9	4.0	4.3	4.6	4.8	8.1	9.1	9.9	10.6	15.9	17.4	18.9	19.9	25.6	28.4	30.7	32.8
3400	...	2.4	2.8	3.0	4.1	4.4	4.7	4.9	8.3	9.3	10.1	10.8	16.2	17.7	19.1	20.3	26.1	29.0	31.4	33.5
3500	...	2.5	2.8	3.0	4.1	4.4	4.7	4.9	8.4	9.4	10.3	11.0	16.5	18.1	19.5	20.7	26.6	29.5	32.0	34.2
3600	...	2.5	2.9	3.1	4.2	4.5	4.8	5.0	8.5	9.6	10.5	11.2	16.7	18.4	19.8	21.1	27.0	30.0	32.6	34.8
3700	...	2.5	2.9	3.1	4.3	4.5	4.8	5.1	8.7	9.8	10.7	11.4	17.0	18.7	20.2	21.5	27.4	30.6	33.2	35.5
3800	...	...	3.0	3.2	4.3	4.6	4.9	5.2	8.8	9.9	10.9	11.6	17.2	18.9	20.4	21.8	27.8	31.0	33.7	36.1
3900	...	...	3.0	3.2	4.3	4.6	4.9	5.2	8.9	10.1	11.0	11.8	17.4	19.2	20.7	22.3	28.2	31.5	34.3	36.6
4000	...	...	3.0	3.3	4.4	4.7	5.0	5.3	9.0	10.2	11.2	12.0	17.6	19.4	21.0	22.5	28.5	31.9	34.7	37.2
4100	...	...	3.1	3.3	4.4	4.7	5.0	5.3	9.1	10.3	11.3	12.2	17.8	19.6	21.3	22.8	28.8	32.3	35.2	37.7
4200	...	...	3.1	3.3	4.4	4.7	5.1	5.4	9.2	10.4	11.5	12.3	17.9	19.8	21.5	23.0	29.1	32.6	35.6	38.2
4300	...	...	3.1	3.3	4.4	4.7	5.1	5.4	9.3	10.5	11.6	12.5	18.0	20.0	21.8	23.0	29.3	33.0	36.0	38.7
4400	...	...	3.2	3.4	4.4	4.8	5.1	5.4	...	10.6	11.7	12.6	18.1	20.1	21.9	23.5	29.5	33.3	36.4	39.1
4500	...	...	3.2	3.4	4.4	4.8	5.1	5.4	...	10.7	11.8	12.7	....	20.3	22.1	23.7	....	33.5	36.7	39.5
4600	...	...	...	3.4	4.4	4.8	5.1	5.5	...	10.8	11.9	12.9	....	20.4	22.3	23.9	....	33.7	37.0	39.9
4700	...	...	...	3.4	4.4	4.8	5.2	5.5	...	10.8	12.0	13.0	....	20.5	22.4	24.1	....	33.9	37.3	40.2
4800	...	...	...	3.4	4.4	4.8	5.2	5.5	...	10.9	12.1	13.3	....	....	22.5	24.2	....	34.1	37.5	40.5
4900	...	...	...	3.4	4.3	4.8	5.1	5.5	...	....	12.1	13.2	....	....	22.6	24.3	....	....	37.7	40.7
5000	...	...	...	3.4	4.3	4.7	5.1	5.5	...	....	12.2	13.2	....	....	22.6	24.4	....	....	37.9	40.9

Compiled by Rubber Manufacturers Assn.

field, N. J. Mr. Whitfield has been connected with the Walker-Turner Co. for fifteen years.

Ohio

FLETCHER F. MILLIGAN Co., 4614 Prospect Ave., Cleveland 3, Ohio, has been appointed northern Ohio sales representative of the CLEVELAND TAPPING MACHINE Co., Hartville, Ohio. E. G. GAUSPOHL AND ASSOCIATES, 2712 Erie St., Cincinnati 8, Ohio, is representative in southwestern Ohio, southern Indiana, and Kentucky. MILTON GRANDQUIST Co., 201 Washington Ave., N., Minneapolis, Minn., has also been made sales representative.

MYRON S. CURTIS was appointed director of engineering of the Warner & Swasey Co. Cleveland, Ohio, at a recent meeting of the board of directors. He was also elected a director of the company, as was FRANK E. JOSEPH. Mr. Curtis succeeds WILLIAM J. BURGER, who retired June 30 from his posts as director of the company and director of engineering.

Myron S. Curtis, Recently Appointed Director of Engineering, Warner & Swasey Co.

LINCOLN ELECTRIC Co., Cleveland 1, Ohio, manufacturer of arc-welding equipment, is now authorizing outstanding service and repair organizations in all the principal industrial centers of the country to be field service shops for Lincoln equipment.

WHITLEY B. MOORE was elected vice-president in charge of sales of the Timken Roller Bearing Co., Canton 6, Ohio, at a recent meeting of the board of directors. He succeeds L. M. KLINEDINST, who has retired after forty-three years' service.

(Left) W. J. Loach, Manager of Carbide Development and Quality Control for Firth Sterling Steel & Carbide Corporation. (Right) Charles W. Iams, Jr., Manager of Carbide Production and Fabrication at the Firth Sterling McKeesport Plant

HAUSER MACHINE TOOL CORPORATION, Manhasset, N. Y., announces the appointment of PAUL E. CHATELAIN & Co., 4 S. Main St., Dayton 2, Ohio, as representative for southern Ohio and Kentucky.

RICHARD R. WILLIAMS has been made direct sales representative in Toledo, Ohio, territory for the Rapids-Standard Co., Inc., Grand Rapids, Mich., manufacturer of material-handling equipment.

DETROIT BROACH Co., Detroit, Mich., announces the appointment of JOHN CRAMPTON as representative of the company, with headquarters at 1114 Chester Ave., Cleveland 14, Ohio.

Pennsylvania

FIRTH STERLING STEEL & CARBIDE CORPORATION, McKeesport, Pa., announces the following changes in operating personnel: W. J. LOACH has been made manager of carbide development and quality control; CHARLES W. IAMS, JR., manager of carbide production and fabrication at the McKeesport plant; E. G. MOFFAT, works manager of the corporation's recently completed plant at Milford, Conn.; and A. B. VESTAL, superintendent of plant engineering at McKeesport. L. G. FIRTH, in addition to filling his duties as president of the corporation, will assume the office of director of technical development.

(Left) E. G. Moffat, Newly Appointed Works Manager of Firth Sterling Milford Plant. (Right) A. B. Vestal, Superintendent of Plant Engineering at McKeesport Plant

The company also announces that, in the future, its sales and manufacturing policy will be to concentrate on the production of sintered-carbide metals in all forms and standard single-point tools and dies. Other carbide tools and dies will continue to be made where no adequate commercial tool- and die-making facilities are available.

Allmon Steel Co. has been organized as a sales company, dealing principally in steel for special purposes, with offices in the Arrott Bldg., Pittsburgh, Pa., and in Washington, D. C. Fred T. H. Youngman has been elected president; T. W. Pennington, executive vice-president and treasurer; and R. A. Parks, general manager of sales. The entire executive staff was formerly associated with the Jessop Steel Co., Washington, Pa.

International Powder Metallurgy Co., Ridgway, Pa., has recently been organized to manufacture powdered-metal products. The president of the new concern is M. T. Victor, formerly sales and field engineer for the Keystone Carbon Co. The vice-president in charge of production is G. J. Hoehn, who has had fifteen years of experience in the production of powdered-metal parts.

Waldemar Naujoks recently joined the staff of Girard Associates, Chambersburg, Pa., forge and press shop engineers. He was chief engineer for many years of the Steel Improvement Forge Co., Cleveland, Ohio, and more recently, manager of the Forged Valve Division of the Ohio Injector Corporation, Wadsworth, Ohio. Mr. Naujoks, who has long been prominent in basic metal-working circles, has written a number of books and articles on forging practice. In his new capacity, he will serve as a specialist on forge-shop problems and sales.

Waldemar Naujoks, Who has Recently Joined the Staff of Girard Associates

Crozier S. Wileman has been appointed district sales manager at Wilkes-Barre, Pa., for the Link-Belt Co., Chicago, Ill. Mr. Wileman succeeds A. C. Williams, who has retired after forty-three years of service with the company. The Wilkes-Barre headquarters are at 726 Second National Bank Bldg., 15-19 W. Market St.

William D. Taylor has been named superintendent of the inspection department of Lukens Steel Co., Coatesville, Pa., and its divisions. Announcement has been made by the company that the inspection department, which heretofore has been connected with the metallurgical department, is now operated as a separate unit.

Louis W. Mason has been appointed assistant to the general manager of sales of the National Tube Co., subsidiary of the United States Steel Corporation, Pittsburgh, Pa. Henry C. Hoar, formerly manager of sales for the company at St. Louis, Mo., succeeds Mr. Mason as manager of the Pittsburgh sales office.

Robert L. Stubbs, an expert on Cecostamping and sheet-metal fabrication, has been retained as consultant by the Chambersburg Engineering Co., Chambersburg, Pa., manufacturer of the Cecostamp. His services will be available to the company's customers in solving Cecostamping problems.

Hobart C. McDaniel has been appointed manager of the Technical Press Service in the public relations department of the Westinghouse Electric Corporation, Pittsburgh, Pa., succeeding Carl E. Nagel, who has resigned to join the McGraw-Hill Book Co.

Marvin W. Smith has been elected executive vice-president of the Baldwin Locomotive Works, Eddystone, Pa. Mr. Smith was previously vice-president in charge of engineering and research for the Westinghouse Electric Corporation.

Washington Steel Corporation, Washington, Pa., announces the appointment of John C. Richards as general manager of sales; Robert O. Fulton as assistant sales manager; and S. M. McGough as sales representative.

Hunter Pressed Steel Co., Lansdale, Pa., manufacturer of precision springs, has changed its corporate name to the Hunter Spring Co., in order to reflect more accurately the principal business of the concern.

Robert W. Frank has been appointed president and general manager of the Lewis Foundry & Machine Division of the Blaw-Knox Co., Pittsburgh, Pa., succeeding F. E. Walling, who has resigned.

Gordon Austin has been appointed a salesman in the Philadelphia office of the Berger Manufacturing Division, Republic Steel Corporation, Cleveland 1, Ohio.

Wisconsin

G. William Warner, for the last thirty-two years chief inspector for the Allis-Chalmers Mfg. Co., Milwaukee, Wis., retired on July 15 after fifty years of service.

Wheelco Instruments Co. has opened a new office at 138 E. Becher St., Milwaukee 7, Wis. M. A. Embertson, formerly connected with the Chicago office, is in charge.

Obituary

Frederick A. Stevenson, former president of the American Car and Foundry Co., New York, N. Y., died suddenly on July 29 in Wilmington, Del., while on his way to New York from Florida. He was sixty-eight years of age. Mr. Stevenson, who retired from active service with the company in May, 1947, had been associated with the organization for more than forty years in various capacities—as master mechanic, assistant general manager, assistant vice-president in charge of operations, vice-president, senior vice-president, and president. He is survived by his wife and a daughter.

* * *

Film on Cutter-Bit Grinding

A sixteen-millimeter colored sound film entitled "Grinding and Use of Basic Lathe Tool Cutter Bits" has been announced by the South Bend Lathe Works, South Bend, Ind. This is the third in a series of films based on the book, "How to Run a Lathe." The film shows the various steps necessary to properly grind and use cutter bits for such lathe operations as threading, facing, boring, forming, turning, and cutting off. The film is distributed on a free loan basis, but can also be purchased. Other films in the series are "The Lathe" and "Plain Turning." All films are approximately 800 feet in length.

Coming Events

SEPTEMBER 13-17 — THIRD INSTRUMENT CONFERENCE AND EXHIBIT under the sponsorship of the Instrument Society of America, Pittsburgh 12, Pa., in Convention Hall, Philadelphia, Pa.

SEPTEMBER 27 - OCTOBER 1 — THIRD NATIONAL PLASTICS EXPOSITION in Grand Central Palace, New York. Sponsored by the Society of the Plastics Industry, Inc. Chairman, Nelson E. Gage, 295 Madison Ave., New York City.

SEPTEMBER 28-OCTOBER 1—IRON AND STEEL EXPOSITION AND CONVENTION OF THE ASSOCIATION OF IRON AND STEEL ENGINEERS at the Cleveland Public Auditorium, Cleveland, Ohio. For further information, address the Association at 1010 Empire Bldg., Pittsburgh 22, Pa.

OCTOBER 5-7—First regional MATERIALS-HANDLING EXPOSITION at the Mechanics Bldg. in Boston, Mass.

OCTOBER 11-13 — Sixteenth annual convention of the NATIONAL LUBRICATING GREASE INSTITUTE at the Edgewater Beach Hotel, Chicago, Ill. Executive Secretary, Carl E. Bolte, 4638 Mill Creek Parkway, Kansas City 2, Mo.

OCTOBER 11-13—Semi-annual convention of the AMERICAN SOCIETY OF TOOL ENGINEERS, in Los Angeles, Calif., with headquarters at the Biltmore Hotel, Executive Secretary, Harry E. Conrad, 1666 Penobscot Bldg., Detroit 26, Mich.

OCTOBER 20-22 — Thirtieth annual meeting of the AMERICAN STANDARDS ASSOCIATION at the Waldorf-Astoria Hotel in New York. Secretary, G. F. Hussey, Jr., 70 E. 45th St., New York 17, N. Y.

OCTOBER 23-29—Annual convention of the AMERICAN SOCIETY FOR METALS at the Benjamin Franklin Hotel, Philadelphia, Pa. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 25-28—Annual meeting of the INSTITUTE OF METALS DIVISION, AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS at the Hotel Adelphia, Philadelphia, Pa. Division Secretary, Ernest Kirkendall, 29 W. 39th St., New York 18, N. Y.

OCTOBER 25-29 — Annual convention of the AMERICAN WELDING SOCIETY at the Bellevue-Stratford Hotel, Philadelphia, Pa. Secretary, M. M. Kelly, 33 W. 39th St., New York 18, N. Y.

OCTOBER 25 - 29 — Thirtieth annual National Metal Congress and Exposition sponsored by the AMERICAN SOCIETY FOR METALS; headquarters, Commercial Museum and Convention Halls, Philadelphia, Pa. National Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

NOVEMBER 4 - 5 — Third Midwest QUALITY CONTROL CONFERENCE of the American Society for Quality Control at the Sherman Hotel in Chicago. Further details can be obtained from Third Midwest Quality Control Conference, P. O. Box 1097, Chicago, Ill.

NOVEMBER 4-5 — Twelfth annual NATIONAL TIME AND MOTION STUDY CLINIC, sponsored by the Research Division of the INDUSTRIAL MANAGEMENT SOCIETY at the Sheraton Hotel, 505 N. Michigan Ave., Chicago, Ill. General chairman of the Clinic, Ralph H. Landes. For further information, address the Society at 176 W. Adams St., Chicago 3, Ill.

NOVEMBER 4-6 — Annual Technical Forum of the NATIONAL ELECTRONICS CONFERENCE, INC., at the Edgewater Beach Hotel, Chicago, Ill., under the joint sponsorship of the Illinois Institute of Technology, Northwestern University, American Institute of Electrical Engineers, Institute of Radio Engineers, and the University of Illinois. Further information can be obtained from J. A. M. Lyon, Northwestern Technological Institute, Evanston, Ill.

NOVEMBER 28-DECEMBER 3 — Annual convention of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. Secretary, Clarence E. Davies, 29 W. 39th St., New York 18.

NOVEMBER 29-DECEMBER 4 — EIGHTEENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING at the Grand Central Palace in New York. Chairman of the advisory committee, I. E. Moultrop, Grand Central Palace, New York 17, N. Y.

* * *

Two-Day Course on Spring Design, Tolerances, and Specifications

Design engineers who have occasion to specify springs are invited by the Hunter Spring Co., Lansdale, Pa., to attend a two-day refresher course on spring design and specification which will be held during alternate weeks at the plant of the company, starting August 31. The course will include demonstrations of tolerance computation, open forums and discussions, plant visits, and six lectures on basic spring design, the checking of spring specifications, controlling the test load, spring materials and stresses, and inspection and testing methods.

Norton Memorial Book

The Norton Co., Worcester, Mass., has paid an impressive tribute to the sixty-one employes of the company who died in World War II and to the 2480 who served in the Armed Forces by the publication of a memorial book entitled "Under Our Flag." The book contains charcoal portraits of the men who did not return from the war, and the original drawings have been framed and presented to the next of kin. Opposite the portrait of each man in the book there appears a page containing a brief description of his war record and a drawing illustrating his branch of service. A complete list of the employes who served with the Army, Navy, Coast Goard, and Merchant Marine is given. Copies of the book have been distributed to the families of the deceased veterans and to veteran employes now working for the company. The book will also be available to all Norton employes.

* * *

Secretary of State Marshall Made Honorary Member of A.S.M.E.

The American Society of Mechanical Engineers recently presented Secretary of State Marshall with a certificate of honorary membership during an informal luncheon given in his honor at the Hotel Statler in Washington, D. C. E. G. Bailey, president of the Society, conferred the honor. Secretary Marshall was cited "for his distinguished services in military science and as Chief of Staff and General of the Army during World War II and as present Secretary of State." The honorary membership was originally scheduled to be conferred at the Society's annual meeting last December, but had to be deferred because Secretary Marshall was attending the Council of Foreign Ministers in London at that time.

* * *

New Course on Effect of Temperature on Materials

New York University College of Engineering has inaugurated a new course entitled "Effect of Temperature on Materials of Construction." The course will present the principles that govern the behavior of metals and non-metals subjected to certain temperature ranges and the techniques employed in their engineering use. Further information can be obtained from New York University, Washington Square, New York 3, N. Y.

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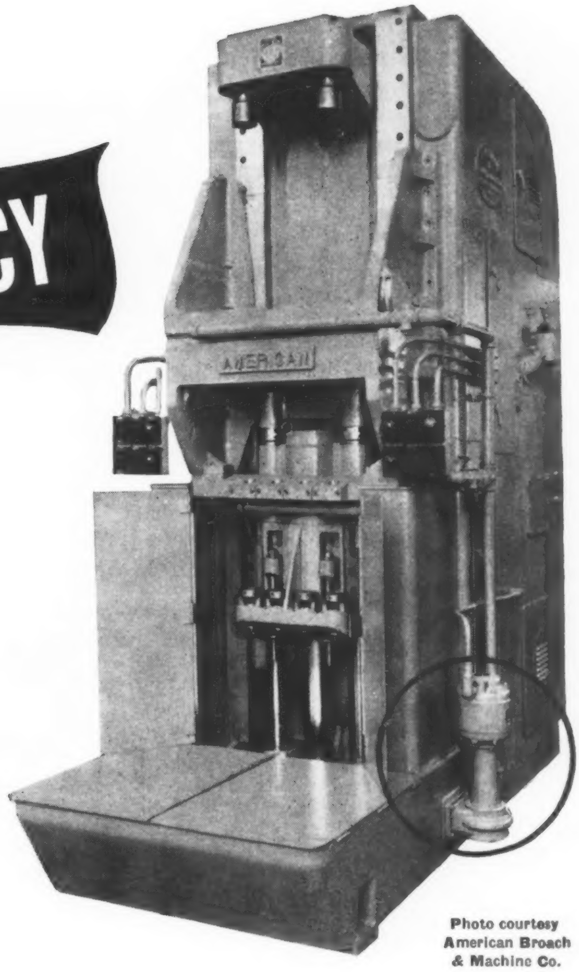

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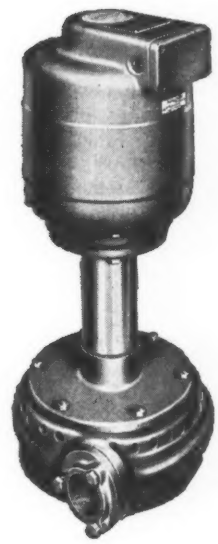

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New Books and Publications

METALS HANDBOOK (1948) Edition). 1444 pages, 8 1/2 by 11 inches. Published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, O. Price, $15.

The 1948 edition of this important handbook of scientific data on metals is about 40 per cent larger than the previous edition, published in 1939. Long accepted as the authoritative source of metallurgical facts, the new handbook covers the research and developments that grew out of war production but that hitherto, for security reasons, have not been made public. Over six hundred engineering and production specialists contributed articles on advanced methods of producing metal parts.

The book covers both ferrous and non-ferrous metals, and is divided into four principal sections under the following classifications: General; Ferrous Metals; Non-Ferrous Metals; and Constitution of Alloys. There are seventy-four articles on metals, processes, and methods in the general section. Among these are included new summaries of wear, oxidation, stress corrosion, relief of residual stresses, and service failures. The 131 articles on ferrous metals cover the manufacture of iron and steel, shaping, testing, welding, heat-treating, finishing, case hardening, coating, and surface treatment. The non-ferrous metals section contains 102 articles and 220 data sheets and includes, for the first time, discussions of melting, shaping, treating, and corrosion.

A new feature of this edition is a section on the eight precious metals. The first extensive collection of alloy phase diagrams published is presented in the Constitution of Alloys section of the book.

MODERN PLASTICS ENCYCLOPEDIA (1948 Edition). 1673 pages, 8½ by 11½ inches. Published by Plastics Catalogue Corporation, 122 E. 42nd St., New York 17, N. Y. Price (including a separate package of twelve technical charts), $8.50.

This comprehensive plastics encyclopedia covers the properties, production, and application of plastics in hundreds of industries. One of the most interesting features of the book is the first sixty-four pages, which illustrate 122 entirely new plastic products in a wide variety of fields. Each product is accompanied with a detailed explanation of the application, the material used, how it was made, and the advantages of using plastics.

The present book incorporates for the first time the catalogue of plastics stock molds which was published four years ago. This section illustrates over 2000 products for which stock molds are available, including molded parts, cast shapes, and extrusions. The name and address of the manufacturer of each product are included.

The encyclopedia explains how to select materials and tells which are suited for specific applications. It covers the properties of plastics, and shows how to identify the various plastics materials. There is detailed information on how to make molds, molding processes, and the advantages and limitations of each process. All types of molding—compression, injection, and transfer—are covered, as well as blow molding, pulp molding, and solvent molding.

A directory covering 129 pages tells where to buy materials, machinery, supplies, and services.

PRINCIPLES OF PERSONNEL TESTING. By C. H. Lawshe, Jr. 227 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price $3.50.

This book describes the accepted procedure for selecting and using personnel tests in business and industry. It covers the various types of tests, and gives examples to indicate those kinds of situations in which specific types of tests have been used. Emphasis throughout has been placed upon procedure or results rather than theory. The various tests covered include mental ability tests; temperament and personality tests; interest and preference tests; and tests for various types of workers, such as mechanical, clerical, and supervisory workers, and salesmen. The methods of constructing a test and inaugurating and operating a test program are described.

DESIGNS FOR HELICOPTERS. By I. B. Laskowitz. 23 pages, 8 by 10 1/2 inches. Published by the author, 284 Eastern Parkway, Brooklyn 25, N. Y. Price, $2.

The author's patent specifications and drawings of three different designs for helicopters with manual and automatic means for changing the blade pitch angle are contained in this booklet. Outline drawings show the application of the principles to variable-speed steering and variable-pitch steering of co-axial rotors and to main and auxiliary rotors.

THE EFFECT OF NON-UNIFORM DISTRIBUTION OF STRESS ON THE YIELD STRENGTH OF STEEL. By Dimitry Morkovin and Omar Sidebottom. 74 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin No. 372 of the Engineering Experiment Station. Price, 50 cents.

Service award pins were presented at a banquet on June 15 to 201 men and women employes of the Landis Tool Co., Waynesboro, Pa., who have had twenty years or more of continuous employment with the company. The total represented 5396 years of service. Three employes received pins for fifty or more years of service, five for forty-five years, and nine for forty years. Gold pins set with precious stones were awarded by M. A. Hollengreen, president of the company. Tell Berna, general manager of the National Machine Tool Builders' Association, and A. G. Bryant, president of the Association, were the principal speakers on this occasion. In the illustration, Mr. Hollengreen is presenting a fifty-year service pin to J. E. Schuman. Another fifty-year veteran, J. W. Little, is seen seated in foreground